Section V Natural Resources Stewardship Plan

Overview

Spring Lake Park Reserve displays an impressive assemblage of natural landscape features, ranging from dramatic views of the Mississippi River and Spring Lake to unique natural landscapes internal to the park. The park's innate natural qualities provide a strong foundation for public enjoyment and enrichment. These same qualities also provide a unique opportunity to protect a natural environment for its intrinsic values, such as biodiversity, preservation of our natural heritage, open space, scenery, and respite from the built form.

Stewardship, which refers to the thoughtful care of the park's natural resources, is of paramount importance to preserving and protecting its intrinsic values. The forthcoming stewardship plan provides a vision for the future and a framework for restoring and managing the natural resources within the park.

Interface with the Dakota County Parks Comprehensive Natural Resources Management Plan (CNRMP)

The CNRMP provides an overview of natural features and a concept for restoring the ecological systems within Spring Lake Park Reserve. The CNRMP stated restoration concept is to:

> *"Protect and enhance scenic vistas and viewsheds, control invasive alien and native plants, protect old-growth forest, establish native savannas, and restore bluff prairie area."*

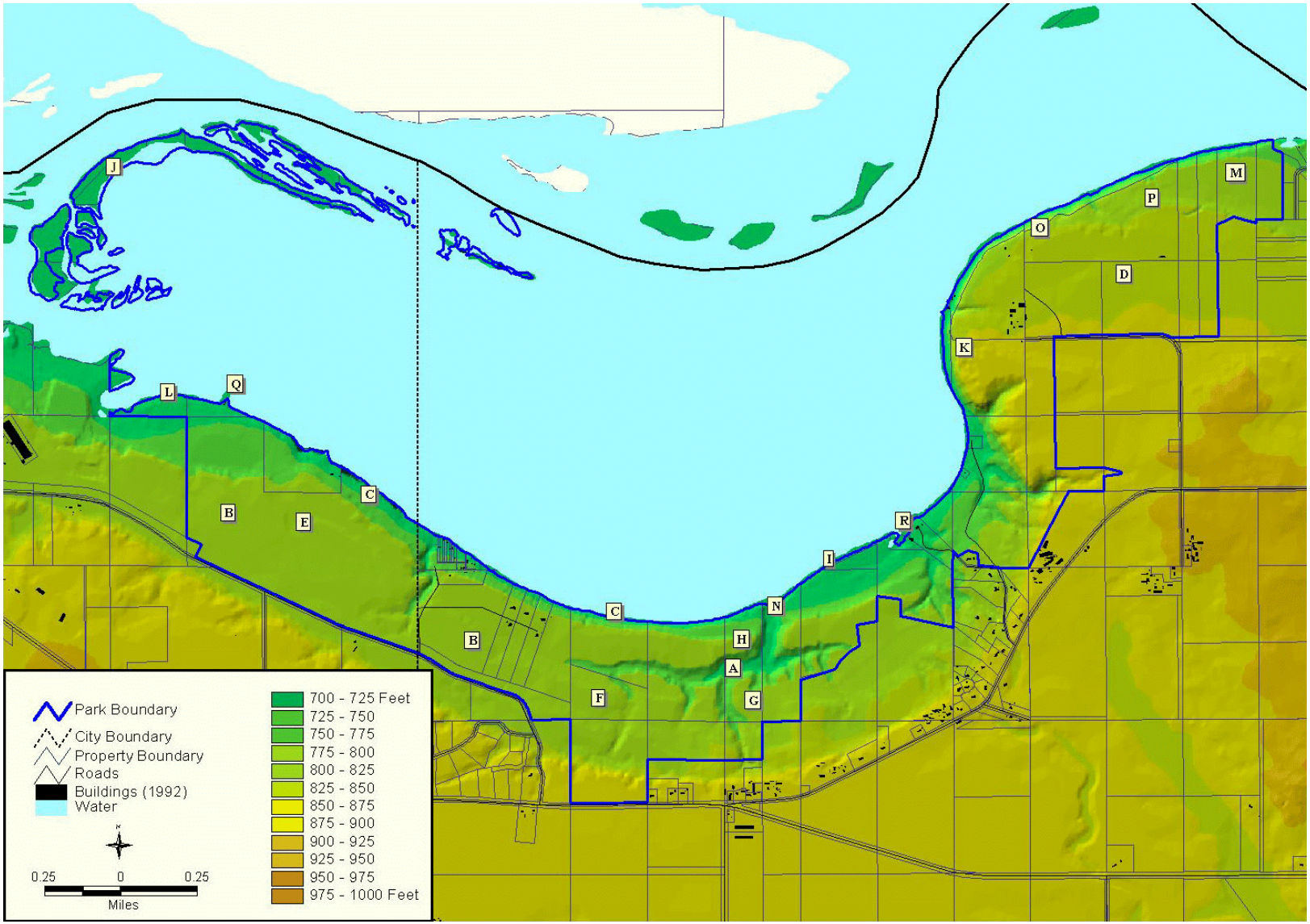
Within the CNRMP, a number of large and small area natural features were identified, as illustrated in figure 5.1.

The natural resources inventory and forthcoming natural resource stewardship plan complement the CNRMP and are consistent with its goals and objectives for Spring Lake Park Reserve. (For additional information, refer to the Dakota County Parks Plan – Natural Resources Management Plan Section, pages NR 59 – NR 61.)

Figure 5.1 – Map from CNRMP illustrating key natural and man-made features of the park.

Features Identified in the CNRMP

A. Spring Lake Ravine
B. Hubbard Sand Terrace
C. North Slope Red Oak Forest
D. Eastern Parkland
E. Western Native Savanna
F. Three Sandy Fields
G. Kittentail Savanna
H. Ironwood Woodland
I. Central Sandbank Shore
J. Islands in the River
K. Bluff Prairie
L. Rocky West Shore
M. White Oak Xeric Woodland
N. Spring Creek Wetland
O. Bedrock Cliff
P. East Hardwood Forest
Q. Cottonwood Point
R. Spring Lake Bay (Mauch's Landing)



Natural Resources – Dominant Physical Features

View of the lake and river from Schaar's Bluff gives a sense of the dominance of these features.

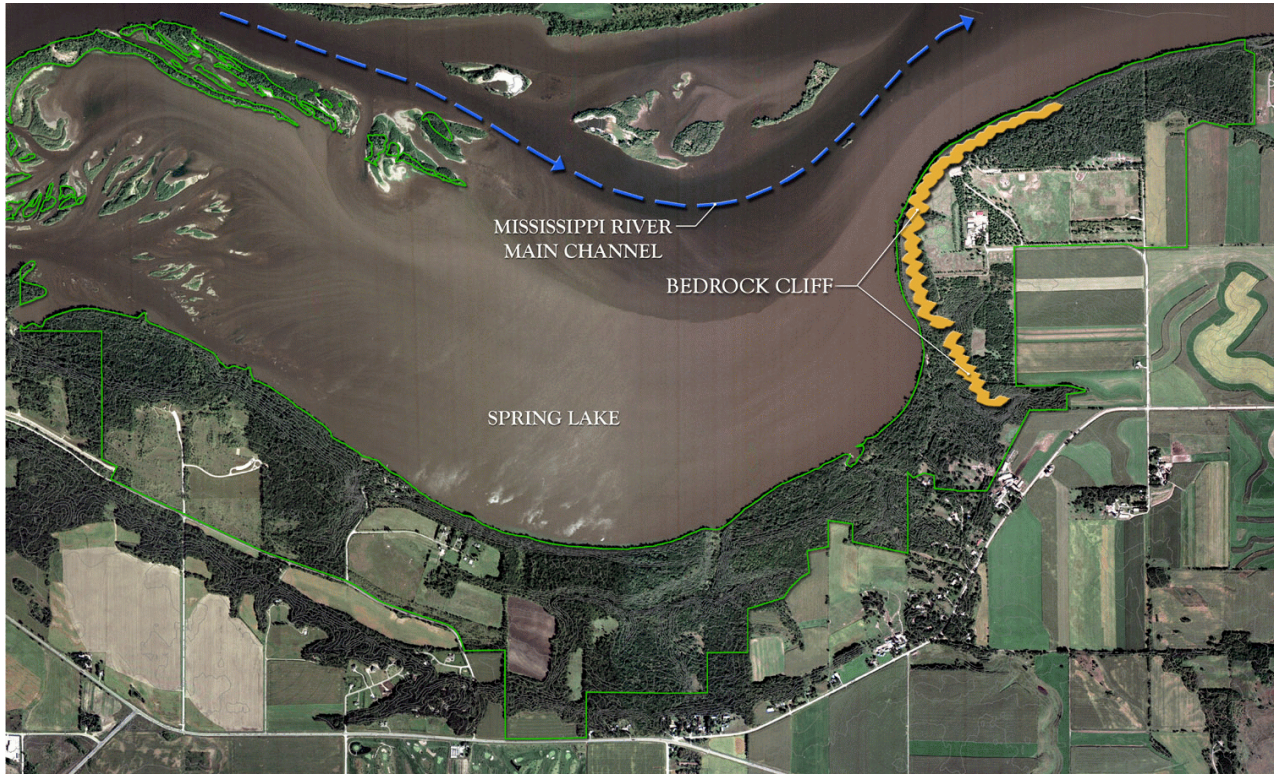
There are a number of dominant physical features of the park that give it its unique qualities. The Mississippi River, bluffs, and topography, and ecological diversity provide a compelling park setting that is uncommon and distinctive in the regional park system. Each of these features were major factors in developing themes for the park and shaping the development program. The following provides an overview of each of these features.

Mississippi River and Spring Lake

Its location along the Mississippi River and adjacency to Spring Lake are the dominant physical features of Spring Lake Park Reserve. Situated along the Mississippi Flyway, the river and lake provide essential stopovers for migratory waterfowl and habitat for an impressive variety of wildlife species.

As the third largest river in the world, the size and scale of the Mississippi naturally draws people to its scenic valley for observation of nature, water-based recreation, hunting, and fishing. Figure 5.2 illustrates the dominance of the river and lake, which underscores the inherent value of these features to the park's master plan.

Figure 5.2– Aerial view of the Mississippi River and Spring Lake.



Bluffs

As illustrated in figure 5.2 on the eastern end of the property, the park exhibits a dominant bedrock cliff that rises 150 feet from the lake and river, creating a bluff overlooking the river. In addition to providing dramatic views of the river, lake, and surrounding landscape, the cliff area harbors several unique plant communities.

View of the cliff and bluff from the river.

Aerial view of the bedrock cliff on the eastern end of the park.

Ravines, Slopes, and Terraces

In addition to the cliffs and bluffs, Spring Lake Park Reserve also offers other dramatic landforms that add to its natural qualities. Formed over the millennia by glacial activity and erosion, the topographic changes across the site create ravines and terraces that give the park outstanding landscape features that complement the river, lake, and cliffs. Although not as readily observable from a specific viewpoint, these features nonetheless are integral to the unique experience that is offered by the park.

As illustrated in figure 5.3, the landforms along the river are characterized by severe slopes and bluff lines. In addition to the elevation change from the river to the top of the bluff as noted, many of the slopes are well in excess of 30%. As illustrated in figure 5.4, the topographic changes across the site create a series of terraces from the river up to the bluff land.

Figure 5.3 – Slope analysis exhibiting topographic changes across the site.

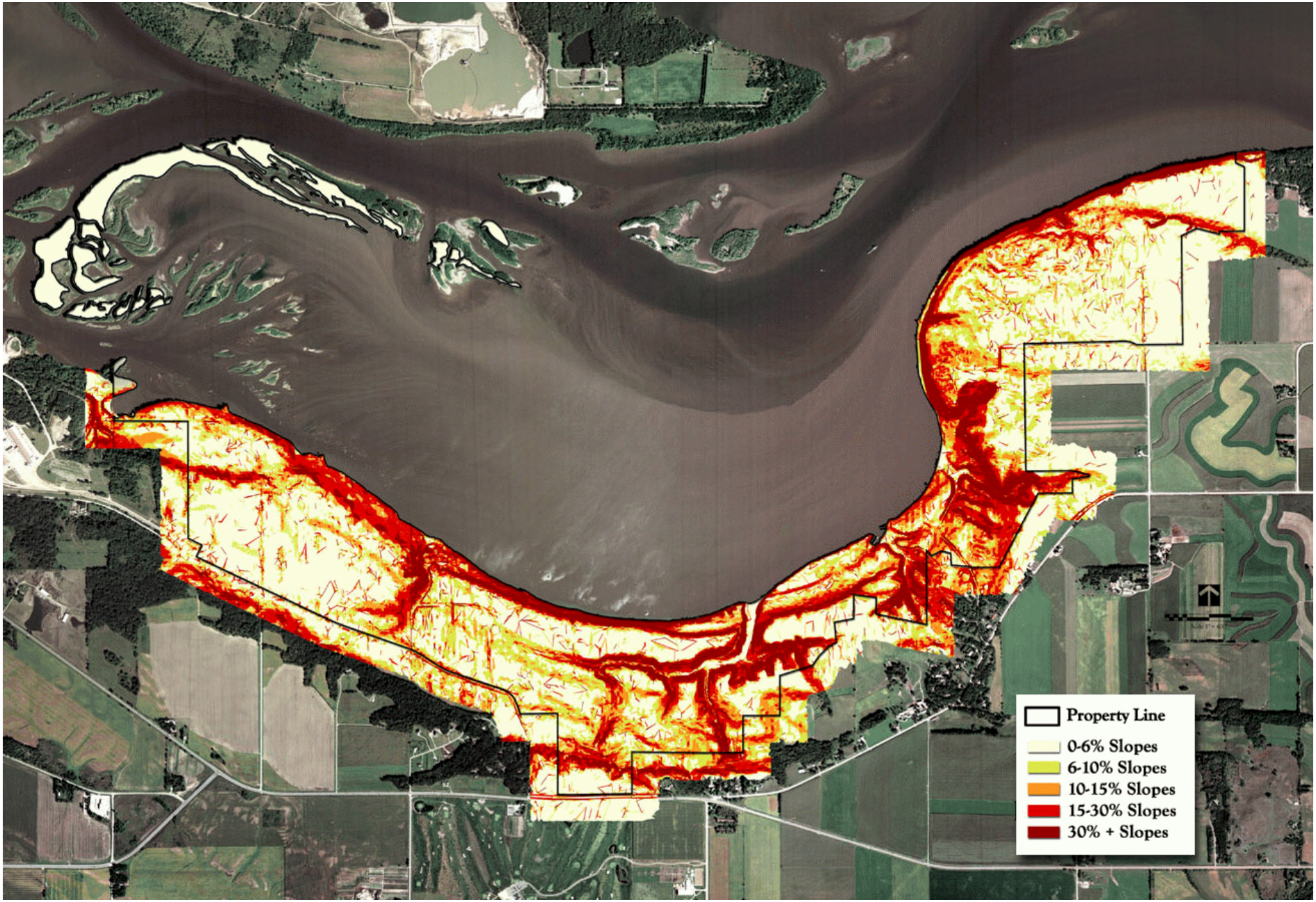
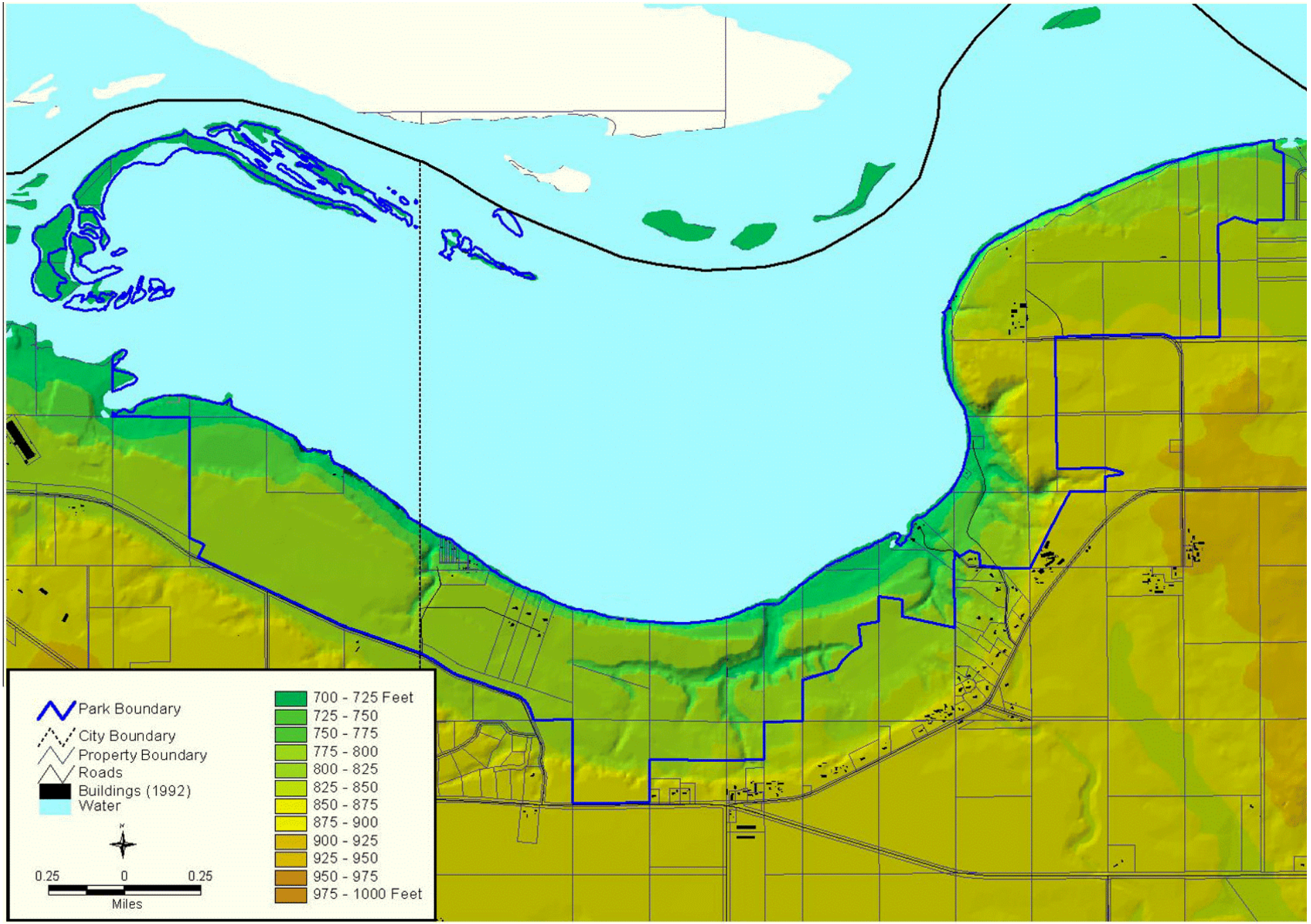


Figure 5.4 – Terraces created by topographic changes across the site.



As some of the most outstanding landscape features of the park, the ravines, bluff lines, terraces, and steep slopes will be preserved for their natural qualities and ecological values. As considered in Section III – Park Boundary and Acquisition Plan, the dramatic topographic changes also pose concerns about viewshed protection, in which views across the park from various vantage points are inherently impacted by off-site land use and development.

Site Soils

As figure 5.5 illustrates, much of the western end of the park is covered by a Hubbard sand terrace, which transitions to a silty loam under a number of soil classifications in the eastern end of the park. These soils range from well-drained to excessively-drained. There is also a loamy sand concentrated along the heads of major ravine branches. Silt loam covers much of the flat land above the bluff lines. Soils associated with the low areas near the river's edge are seasonally inundated with water. The bluff lines and ravine sides are composed of steep, well-drained soils and bedrock outcrops.

From an ecological perspective, the ecological systems and plant communities that are to be restored on the site under the stewardship program must be consistent with the inherent soil characteristics. Although seemingly intuitive, there are several plantings within the park in which species selection is not consistent with the soils, hydrology, topography and micro-climate of the area. This has resulted in stunted growth of trees, poor ground cover that leads to erosion, and inconsistencies in native plant communities common to the area.

As figure 5.6 illustrates, there are some development limitations posed by soils. From a development perspective, the major concern with the soils is the propensity for erosion on steep slopes, poorly vegetated areas, and adjacent to hard surfaced developed areas where runoff can become concentrated. Particular attention must be given to trail development, where design approaches and actual trail placement in the park must be in a sustainable location. The ravines, steep slopes, and bluffs also inherently pose severe constraints on development and for the most part are best left undisturbed. In general, the existing development footprint is located in areas where the soils are reasonably conducive to supporting built structures. New facilities are also proposed for areas where soils offer the least limitations on development.

Although the sandy soils within the park are suitable for development, they are often too arid to support traditional bluegrass of fescue lawns unless irrigation is provided, which can be expensive to install and operate. In part for this reason, lawn areas within the park will be kept to the minimum necessary to support a defined function.

The prairie near the Youth Lodge is on the Hubbard sand terrace. Highly erodible, establishing healthy native ecological systems that are adapted to the conditions is vital to preventing erosion and degradation to downstream systems, the lake, and the river.

Figure 5.5 – Soil types found across the park.

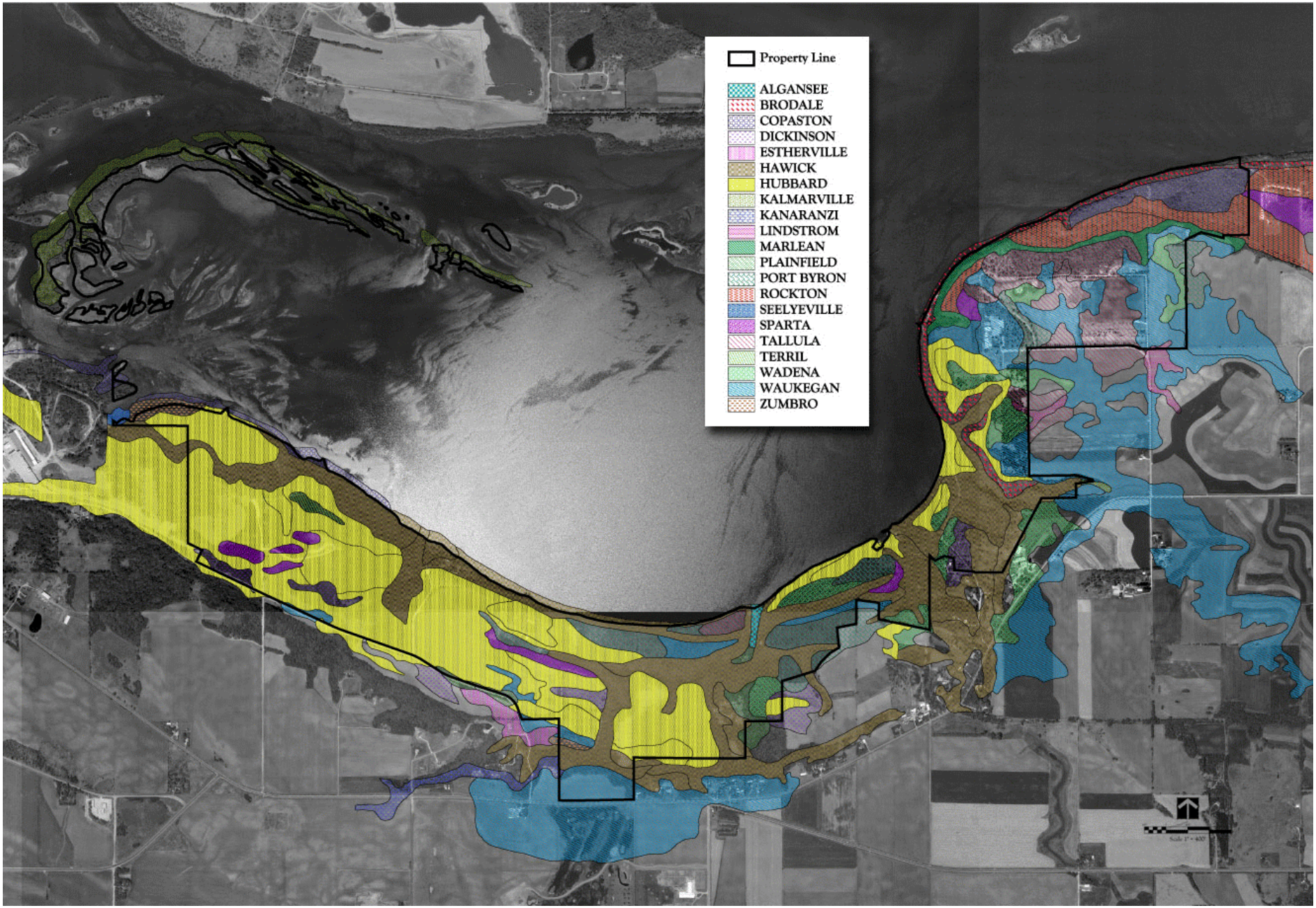
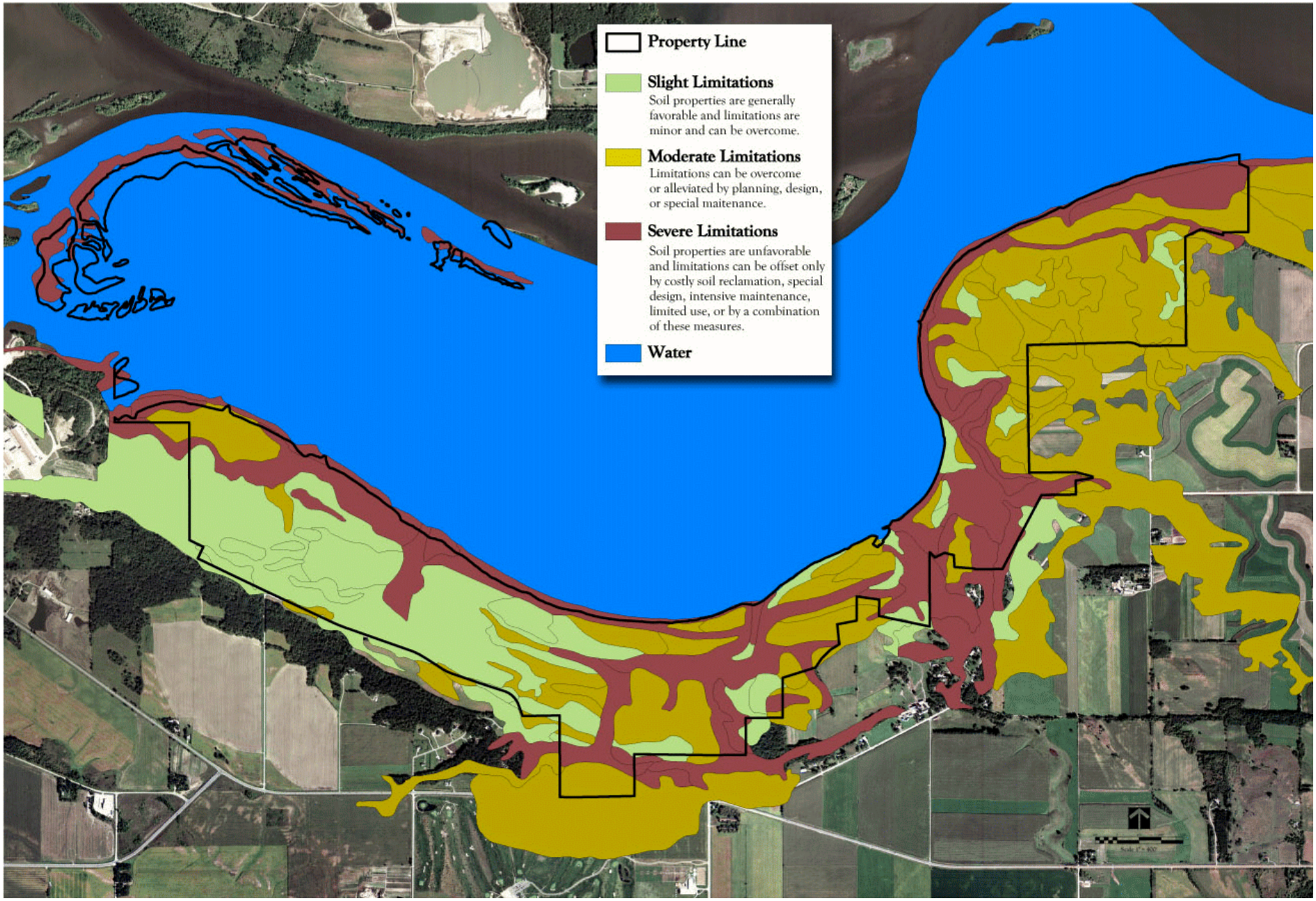


Figure 5.6 – Soils buildability analysis.



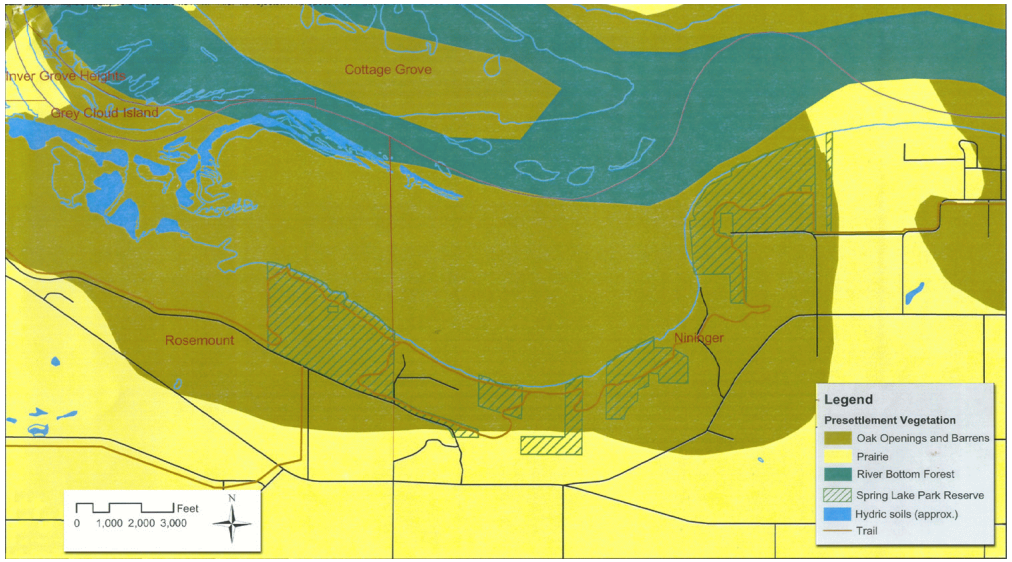
Historic and Current Condition of Ecological Communities

In the fall/winter of 2002 through the spring of 2003, several field investigations focusing on natural resources were conducted as part of the planning process. The goals of the field reconnaissance were to review the Minnesota Land Cover Classification System (MLCCS) data, provide a greater level of detail for the park natural resources inventory, and define other environmental issues.

Historical Perspective

From a historical perspective, the landscape and natural habitat characteristics within Dakota County and Spring Lake Park Reserve have changed considerably over the last 150 years, as illustrated in figure 5.7. As shown, much of the land within and surrounding the park was once covered by oak openings/barrens, prairie, and river bottom forests. Although the map is at a gross scale and only depicts the dominant ecological systems, it does articulate the degree to which the land has been altered since settlement has occurred.

Figure 5.7 – Presettlement vegetation in the Spring Lake Park Reserve area. Source: Marschner 1974.

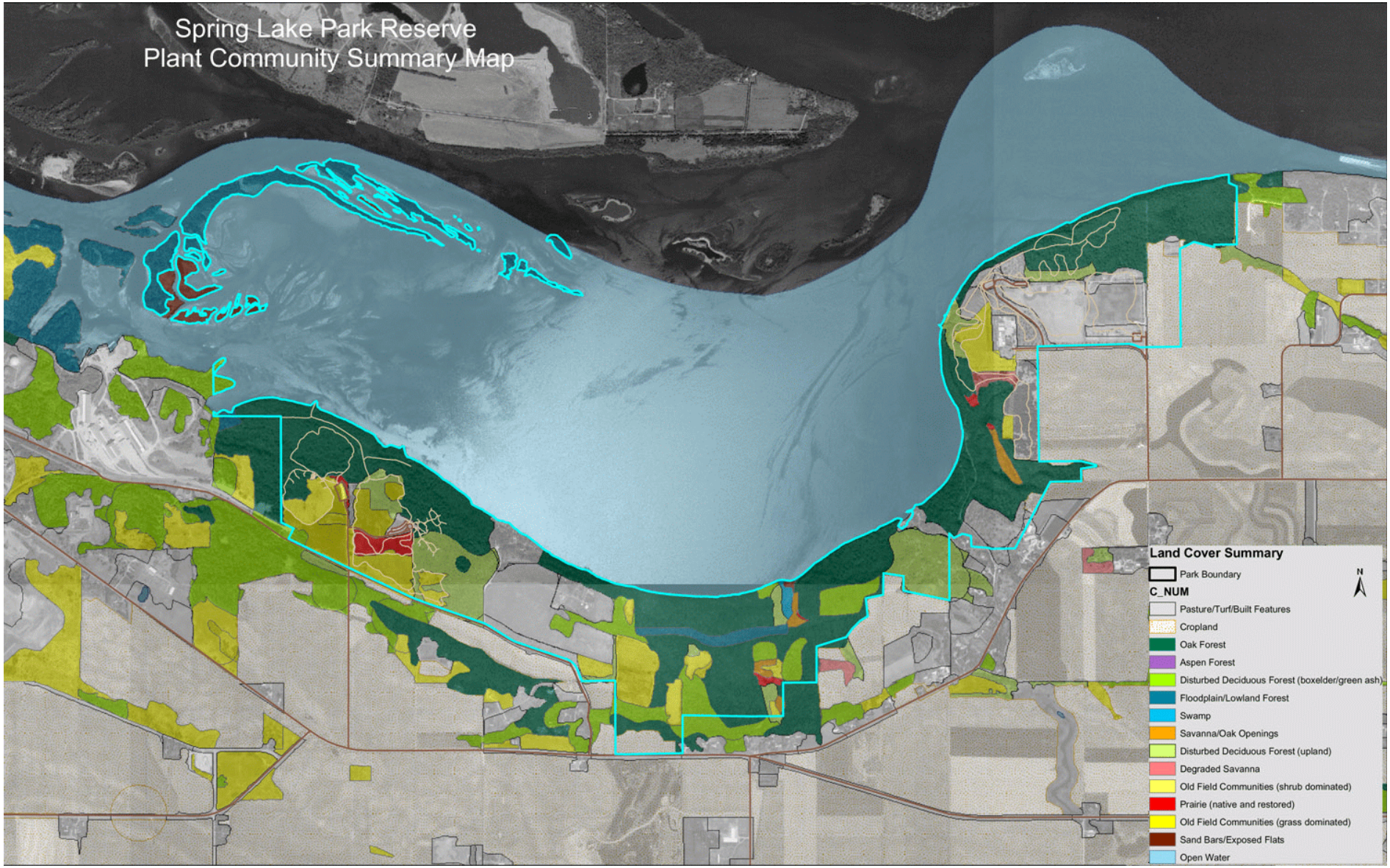


Although much of the historic diversity has been lost over the years, adequate remnants remain to hold the promise that the park can be restored to a sustainable, healthy level through a well-defined stewardship plan.

Mapping of Natural Resources within the Park

The existing site conditions and land cover mapping shown in figure 5.8 represent the findings of field reconnaissance conducted for the master plan. This investigation proved fruitful in documenting the existing conditions found across the site and the ecological issues being faced. The information and mapping presented in this section was prepared for master planning purposes and to establish an underpinning for the natural resource stewardship plan.

Figure 5.8 – Natural Resource Inventory – Existing Ecological Communities



Land Classification Categories: The land cover categories defined in figure 5.8 are based on the Minnesota Land Cover Classification System (MLCCS) developed by the Minnesota Department of Natural Resources. The categories as shown represent a simplification of these classifications for master planning purposes. The following table provides a brief description of the most significant cover types to characterize the general condition of the park's ecological communities.

Land Cover Type(s)	Characteristics	Plant Communities	Ecological Quality	Wildlife Habitat Quality
Pasture/Turf/Built Features	Areas previously developed for recreational uses, farms, and other types of development. Also includes pastures and maintained lawn areas.	Pasture lands include some oak and other tree species.	Low ecological quality in most developed areas. Long-term use of lands for pastures has degraded trees and natural vegetation. Trees can be prone to being blown over in strong winds.	Little overall wildlife value.
Cropland	Used for rotational crop production and agriculture.	Variety of crops, ranging from soybeans to corn.	Low ecological quality, with little overall plant species diversity.	Provides cover during growing season and food for select species, such as deer. Otherwise, low wildlife value.
Savanna/Oak Openings	Limited stands of intact savanna systems remain within the park.	Remnant oak systems and few other species. Mostly older age classes with significant invasion of buckthorn and other woody species.	Degrading ecological quality, especially in terms of invasion of non-native invasive species. Limited regeneration of new oaks and other desirable overstory trees. Stable ground cover also lacking due to invasion by buckthorn.	Diminishing habitat value as invasive plant species become more dominant.
Forests (all types)	Stands of trees with a closed canopy of 70 to 100 percent cover.	Remnant oak systems, with sugar maples, elm, basswoods, green ash and other species mixed in. Oak system merging with other forest types due to lack of natural processes, especially fire, and active management.		
Old Fields	Areas dominated by non-native and voluntary vegetation.	Ranges from open grasslands to shrub-dominated plant communities.	Currently low ecological quality, but offers the opportunity for improvement through a sound stewardship program.	Ground cover provides some wildlife habitat value. But the lack of plant diversity limits wildlife species diversity as well.
Prairies	Related primarily to restored prairie systems that occurred in relatively recent years. Also includes remnant prairie systems that remain diverse and unique, but are also very limited.	Potential for high diversity of plant species, including big bluestem, indiangrass, and cordgrass.	Restored or remnant prairie systems offer high ecological quality. Overall current acreage within the park is very limited.	High value to wildlife when plant diversity is robust.

Buckthorn invasion of the woodlands and forests is a major threat to their long-term sustainability.

Additional Characterizations of Existing Ecological Conditions

In addition to the inventory mapping, some general characterizations are worth noting to greater define the existing ecological conditions of the site.

Primary Ecological Systems: Upland oak forest, savanna, and prairie are the dominant ecological systems. In many areas, native savanna areas have transitioned to mesic oak forest systems that are degraded due to lack of management. General tree age categories common in this region are 50-70 years, 90-110 years, 130-170 years, and 190-290 years. The oldest trees are usually on bedrock. Younger age classes are typical in this region. High prevalence of disease, such as heart rot, was found in very large trees. The park also provides an extraordinary example of a historic fire gradient from the west end eastward, although less so in ravine bottoms. Fire-vulnerable species (sugar maple, black ash, and Canada yew) are closest to the river.

Ecological Conditions in the Western Part of the Park: A mix of oak savanna and mesic oak forest. This area was most likely more prairie historically, not savanna. Most trees are from 70 to 90 years old and many have heart-rot. The poor condition of the trees is attributed to soil constraints (shallow depth and sandy composition). Trees are also highly vulnerable to wind throw, which is extensive in some areas. The understory is between 20 and 30 years old, likely resulting from a past period of intense grazing. Siberian elm is a common understory species. The native groundcover systems most likely collapsed due to shade suppression. Severe erosion was noted in some areas from overland flow concentrating into rills and channels. Adjacent marshes are dewatering and invasive species have moved in (reed canary grass). Invasive shrubs (honeysuckle and buckthorn) are common throughout. Oak wilt was seen in the Youth Lodge area and stump sprouts indicate logging activity 60 or more years ago.

Ecological Conditions in the Central Ravine Area: Some good examples of bluff prairie can be found. Oak savannas in this area are distressed and could close in with underbrush and more trees. The lowland ravine bottoms are dominated by elm and also include some sedge meadow areas. Damage by ATV's using the area is apparent. There are stands of ironwood above the large central ravine and some nice oak areas near the boat launch, just east of the park's central ravine. Oak wilt was noted in some areas. Coring tests found that trees range in age from 130 to 290 years, with more in the 170-290 year range. Coring also demonstrated 4 fire scars. In one area, a significant mesic forest remnant was found. Where there are light gaps that penetrate the canopy, remnants of native ground cover were also noted. Understory trees range in age from 50 to 70 years and honeysuckle was 25-30 years old.

Ecological Conditions in the Eastern Part of the Park: Includes plantation areas and mature oak/aspen woods. The west face of the bluff has high quality communities – oak savanna and red cedar. Strong shade suppression on Schaar's Bluff is a serious issue with the native ground layer. Tree ages were estimated to be between 130 to 290 years, with most between 150 and 170 years. The oldest trees generally are found on rocky or steep soils on the western side of the Mississippi River.

Mississippi River and Spring Lake Conditions: State and federal water quality reports for Mississippi River Pool 2 (including Spring Lake) generally show improvement in the river's health over the past decade. The river remains on state and federal lists of impaired waters, however, due to contaminated riverbed sediments. Mercury and PCBs are persistent toxins that have been detected in Pool 2 sediments and in various fish species. The State of Minnesota has issued advisories recommending restricted consumption of fish caught in Pool 2.

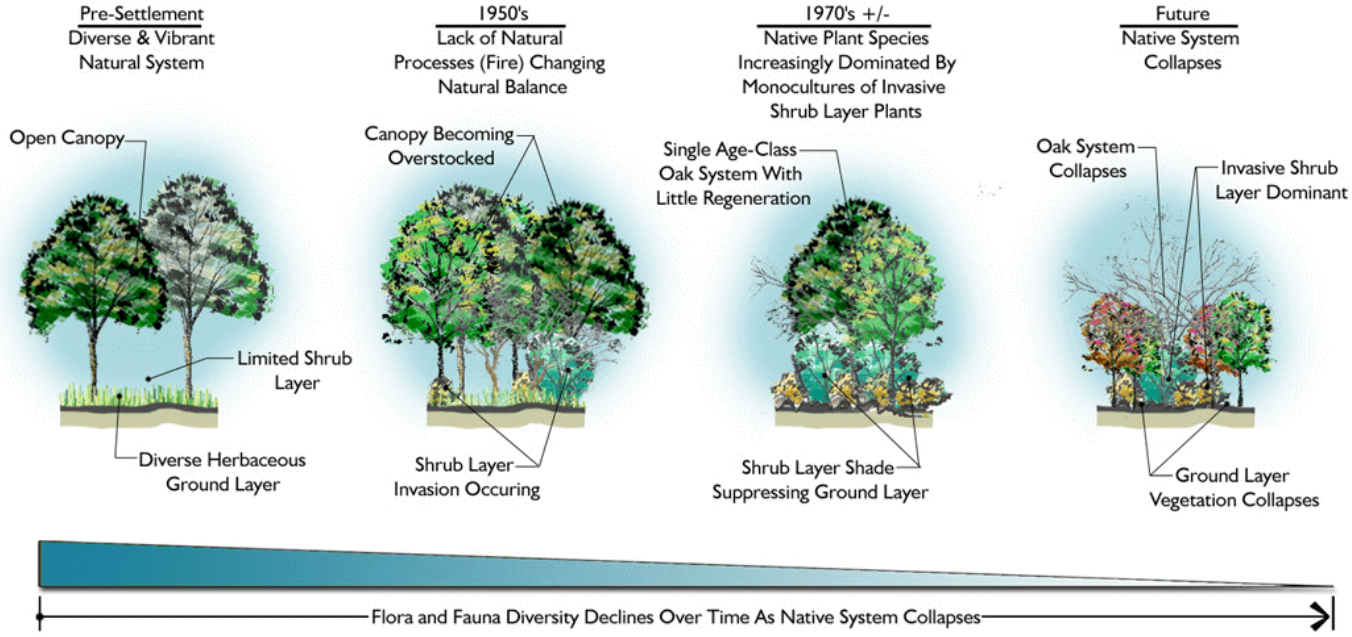
Spring Lake supports a wide variety of fish species, including some game species such as walleye and channel catfish. Special regulations for Mississippi River Pool 2 allow only catch and release fishing for walleye, sauger, smallmouth bass and largemouth bass.

Observed Trends in Ecological Systems

Without human intervention and conscientious stewardship, it is expected that the overall trend of the ecological systems within the park will be toward continued decline, as measured by bio-diversity and general ecological health. Figure 5.9 graphically illustrates the current trend in a typical oak savanna system found in this and many other Midwestern regions.

Without human intervention and conscientious stewardship, it is expected that the overall trend of the ecological systems within the park will be toward continued decline.

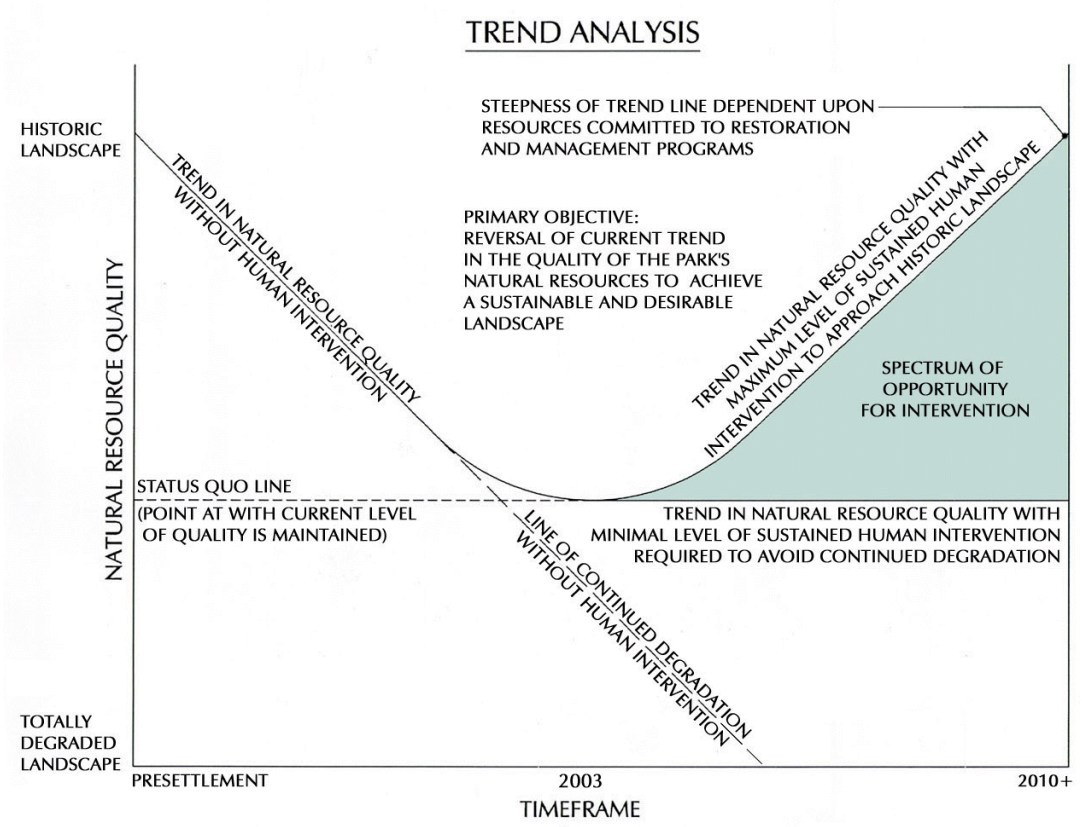
Figure 5.9 – Ecological trend in oak savanna system.



This example is reflective of what is happening to varying degrees in all of the ecological systems found throughout the park. Although some of the ecological degradation will have lasting affects, there are also many opportunities to forestall further decline and make substantial progress toward achieving a more sustainable and healthier landscape for future generations to enjoy. Figure 5.10 graphically illustrates the current overall trend in ecological quality, as well as defining the spectrum of opportunity for reversing this trend.

There are many opportunities to forestall further degradation and make substantial progress toward achieving a more sustainable and healthier landscape for future generations to enjoy.

Figure 5.10- Trend Analysis



Related Threats to Ecological Communities

In additional to the overall trend in ecological conditions, there are some other significant threats facing the natural resources of the park. The following considers the most important of these.

Ecological Systems Fragmentation: The ecological communities within the park are fairly fragmented, which refers to the division of forests, prairies, and other native plant communities into smaller, more isolated areas by roads, farm fields, pastures, development, and a variety of other land uses. Habitat fragmentation not only reduces the *quantity* of food and cover for wildlife, but means less variety and lower *quality* within a given area. Within the context of a resource-based park reserve, habitat fragmentation is of significant concern, which cannot be taken lightly in terms of natural resource stewardship *and* planning for future development within the park.

One of the more perplexing issues facing resource stewardship is the numerous in-holdings scattered throughout the park. These in-holdings contribute significantly to fragmentation and make it exceedingly difficult to implement a cohesive stewardship program.

Even some of the existing park facilities, such as the maintenance facility, contribute to ecological system fragmentation.

External Land Uses: In a number of cases, external land uses do pose threats to the health of the ecological systems within the park. One of the most important of these is erosion caused by unchecked runoff from farm fields and pasture lands. Another is the potential for introduction of non-native plant species and migration of farm chemicals that impede native plant production.

Surrounding Developmental Patterns / Future Land Uses: Although much of surrounding land remains rural and farm land, longer-range land uses could include higher levels of development around the park. This poses a number of threats to the ecological systems within the park, including increased erosion and ecological system fragmentation.

Erosion: As with external land uses causing erosion, there are numerous instances within the park that erosion is a significant issue. With many of the natural systems being degraded, the propensity for erosion within the park is greatly increased, especially given the steep topography and the soil types. Of equal concern is erosion of the lake shoreline, which is often buffeted by strong winds across the breadth of the lake. Continuous erosion of the roadbed and ditches of some of the roads within the park is also a significant threat. This is especially the case with Hilary Path, a Township road that provides access to the existing boat launch.

Erosion of the shoreline is a major concern for much of the lake.

Significant off-site erosion is occurring in some areas of the park, causing concern about sediment migrating to the park and affecting the health of on-site ecological systems.

Inappropriate Uses: Especially prevalent in the middle section of the park, informal trails created by ATV's and other non-authorized vehicles are causing severe degradation to ecological systems and soil structure. Controlling this activity is of paramount importance.

Dumping: In numerous areas of the park, past and present dumping of trash into ravines and ditches is a major issue. The debris itself, along with chemicals and contaminants that leach from it, greatly impacts the health of ecological systems and the aesthetic of the park. Clean up of these sites is a top priority.

Trash piles include large and small items, ranging from refrigerators to old car bodies.

Old barrels, often with unknown contents, also litter some of the ravines.

Natural Resources/Ecological Stewardship Vision

In spite of the current ecological conditions within the park, there are tremendous opportunities for restoring the natural areas and ecological systems to more closely replicate those that were present before settlement occurred. Although restoring the park to fully duplicate systems that were present prior to settlement is technically and economically unachievable, it is reasonable to expect that through conscientious intervention, a more robust natural ecology can be restored to the park for future generations to enjoy.

Natural Resource Stewardship Philosophy

The stewardship plan promotes an ecosystem-based approach to restoration and management. An ecosystem is essentially where things live and represents an interacting group of physical elements (soils, water, plants, animals, etc.) that inhabit a particular place. All of these elements and their interactions need to be considered in developing goals and plans for management. Ecosystem-based management views people as part of the community, and that maintaining a healthy ecosystem is the best way to meet human needs as well as those of other organisms in the community.

General goals of this philosophy are to:

- Enhance the health of the ecosystems in Spring Lake Park Reserve.
- Enhance the biological diversity of its native habitats.
- Provide an appropriate balance between resource preservation and recreational use.

The stewardship plan focuses on achieving a sustainable landscape quality, which is defined as the point at which Dakota County can *indefinitely* maintain a certain acceptable level of resource quality within the context of realistic limits – which is contingent upon two primary factors:

- Public understanding of and commitment to natural resource preservation and stewardship programs.
- Undertaking ecological restoration and management programs that are scientifically sound.

Through a well-defined stewardship program and a concerted, ongoing effort by Dakota County, a certain level of confidence can be gained that the current ecological conditions and trends can be reversed and a more sustainable and higher quality landscape achieved. Note, however, that stewardship programs also need to be flexible due to the changing nature of the living systems addressed by the plan. For these reasons, the plan presented here should be viewed as being neither conclusive nor absolute. It is a starting point in an ongoing process that relies on monitoring and research to provide feedback on program effectiveness.

Long-Range Ecological Vision

The stewardship plan is underpinned by a long range vision for restoring and managing the natural ecological systems within the park, as illustrated in figure 5.11. The vision provides a basis for developing implementation strategies and priorities.

As illustrated previously in figure 5.7, the ecological communities envisioned for the site are consistent with the historic landscape. The mapping of the different systems is based on the characteristics of the land relative to the type of plant community it will support. Soils, slopes, hydrology, micro-climates, and other ecological factors were considerations, as were natural phenomenon such as fire. As a living environment, the ultimate presence of one ecological system over that of another will be determined by natural processes induced though human intervention through the stewardship plan. Although this intervention is necessary, the goal is to let nature take its own course to the degree possible in revitalizing the natural resources of the park.

Figure 5.11 – Long-range ecological vision for Spring Lake Park Reserve.

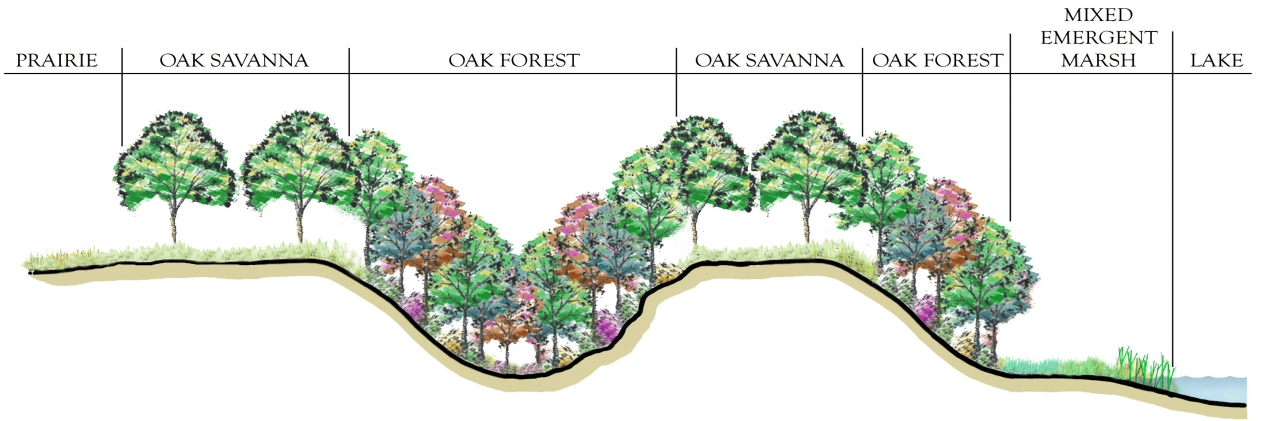
Overview of Predominant Ecological Communities

As illustrated in figure 5.11, the predominant ecological communities envisioned for the park include:

- **Mesic Oak Savanna** – very rare in Minnesota, having historically been found in the prairie to deciduous forest transition zones.
- **Prairies** – dry and mesic prairies are grass-dominated plant communities that occur on dry to wet-mesic sites. Within Spring Lake Park Reserve there are three prairie subtypes; mesic prairie, bedrock bluff prairies, and sand-gravel prairies. These prairies show great variability in species structure that is dependant upon topography, soils and microclimate.
  - **Bedrock bluff prairie** – are found on bluffs along the Mississippi River and tributary valleys in southeastern Minnesota on steep south and west facing slopes. These steep dry prairies are locally known as "goat prairies."
  - **Sand-gravel prairies** – are typically small in size and occur on the drier, steep edges of sand terraces and hillsides having richer soils than those found in bluff prairies.
- **Oak Forest** – European settlement led to the widespread suppression of prairie fires, resulting in oak savannas succeeding to oak woodland unless the sites were heavily grazed. Mesic sites were more likely to have been pre-settlement forest, rather than savanna.
- **Lowland Hardwood Forest** – is a transition forest on wet-mesic sites with seasonally high water tables that do not flood regularly and have mineral soils. (Not specifically mapped due to limited scale.)
- **Seepage Meadow** – most are small in size and limited by topographic relief.
- **Mixed Emergent Marsh** -- occurs on hard pond, lake, or river bottoms.

Figure 5.12 illustrates the basic relationships between these ecological communities.

Figure 5.12– Relationship between ecological communities systems envisioned for the park.



Natural Resources/Ecological Stewardship Plan

The stewardship plan sets forth a framework for restoring and managing the ecological systems found within the park. The plan describes ecological prototypes, implementation strategies and priorities, phases in restoring ecological communities, and the techniques that would be used to restore the various plant communities. The plan also outlines ecological protection zones that influenced development considerations. The following considers each of these plan components.

Ecological Prototypes

Ecological prototypes refer to the general structure, site conditions, vegetative species lists, and other variables attributed to each of the ecological communities illustrated in figure 5.11 and listed on the previous page. Prototypes assist restoration and management efforts by helping compare existing conditions against measurable criteria for healthy systems and in recognizing possible causative agents that result in ecological changes. By recognizing what a healthy system looks like, specific targets or models for management and restoration programs can be developed and implemented.

Ecological prototypes are defined along topographic, soil type and hydrological gradients from high-dry uplands to lowlands and river or lake edges. Based on an initial review of the park, both unaltered and altered ecological prototypes can be found – although unaltered systems are limited to isolated pockets. In unaltered areas, depending on soil types and hydrology, different plant and animal communities have developed over long periods of time and have persisted even to present day under less than ideal circumstances. On these same soil types, alteration of land use and hydrology along with cessation of natural processes have created changes in the plant (and animal) communities. Each of the unaltered and altered types of plant and animal communities fall within a definable ecological prototype, or in some cases, in the ecotonal (i.e., transitional) area between prototypes.

The following descriptions define the dominant and definable prototypes for healthy (unaltered) and unhealthy (altered) ecological systems found within the park. Lacking greater technical evaluation and in-field research, the prototypes presented here serve as a starting point as Dakota County moves forward with its stewardship program for the park. Although these prototypes are not exhaustive, they do articulate the fundamental qualities between healthy and unhealthy ecological systems found within the park.

Note that the prototypes have been developed for use at the master plan level and will require refinement under a more detailed plan that would be required for implementation of the master plan. For consistency with the Minnesota Department of Natural Resources and Metropolitan Council preferences, Dakota County Parks will continue to use the Minnesota Department of Natural Resources' Minnesota Land Cover Classification System (MLCCS) where it has application as part of the stewardship program. This classification system, which is very extensive, is useful for defining natural ecosystems (although it is a bit more limiting in addressing developed or agricultural systems).

Historic Oak Savanna

Healthy Systems

General Structure
- Semi-open to open tree canopy
- Multiple age classes of trees
- Dominant cover of native grasses, sedges, and forbs
- Natural oak regeneration
- Sporadic native shrub layer
- High light levels interspersed with partial/isolated shade

Soils Profile/Topography/Hydrology
- Well drained silt, clay and sand loams, gravelly sands, alluvium glacial features
- Higher and dry sites, and moist, well drained soils

Indicator Species of Healthy System
- Bur oaks
- Northern pin oaks
- Shrub component: chokecherries, low juneberries, gray-bark dogwoods, wolfberries, New Jersey tea, American hazelnuts, leadplant
- Grasses and forbs found in the prairie would be present in savannas, along with oak woodland under-story plants being present in the groves

Unhealthy Systems

General Structure
- Continuous, closed canopy
- Dense layer of non-native shrubs
- Bare, eroding soil
- Low light levels, predominant dense shade
- No oak regeneration
- Few or no young age classes of trees
- Lack of native groundcover vegetation
- Encroachment by development or agriculture

Indicator Species of Unhealthy System
- European buckthorn
- Tartarian honeysuckle
- Black locust
- Boxelder
- European brome, Kentucky bluegrass, and other non-native grasses
- Agricultural weed species

Protection and Management Considerations

Causes of Change
- Cessation of historic fire regimes - the lower frequency of fire on these sites compared to open prairie sites allowed the development of the tree component
- Destruction due to development
- Invasion of competing non-native shrubs
- Encroachment of adjacent development with associated pollutants
- Intensive grazing
- Change in hydrologic regime (drier or wetter)

Restorative Capacity
- Oak Savanna occur on sites where fire was frequent enough to prevent closed tree and shrub canopies so that prairie grasses and forbs are the dominant ground layer
- Highly restorable under well-designed and implemented restoration and management program
- Highly disturbed sites may require replanting of native species, especially ground cover, if native seed bank is absent

Protection Strategy
- Adopt land development practices that place a high priority on ecological protection
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

Oak Forest

Healthy Systems

General Structure

- High biodiversity - plants, insects, birds, and animals
- High diversity of native plant species
- Relatively open canopies, with between 70% and 80% tree cover
- 30%of the tree canopy is composed of oak trees

Soils Profile/Topography/Hydrology

- Nutrient-poor, well-drained sandy soils
- Found on outwash plains and river terraces
- The actual composition of the community is determined by soil moisture, soil type, fire history, and climate

Indicator Species of Healthy System

- Oak trees
- Aspen
- Paper birch
- Black cherry trees
- American hazel
- Gray-bark dogwood
- Blackberries
- Pennsylvania sedge
- Wild geranium
- Virginia creeper
- Wild sarsaparilla

Unhealthy Systems

- Low biodiversity - plants, insects, birds, animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration
- High soil erosion potential
- Nutrient enrichment

Indicator Species of Unhealthy System

- European buckthorn
- Tartarian honeysuckle
- Black locust
- Boxelder
- European brome, Kentucky bluegrass, and other non-native grasses
- Agricultural weeds

Protection and Management Considerations

Causes of Change

- Introduction of post settlement agriculture and livestock grazing
- Soil disturbance from development
- Cessation of periodic fire
- Invasion of competitive, non-native plants
- Change in hydrologic regime (wetter or drier)

Restorative Capacity

- Highly restorable under well-designed and implemented restoration and management program
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy

- Adopt land development practices that place a high priority on ecological protection
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

Mesic Prairie

Healthy Systems

General Structure

- High biodiversity – plants, insects, birds, and animals
- High diversity of native plant species
- Predominance of warm-season grass species
- Natural succession and progression toward conservative species
- Full to nearly full sun
- Drought tolerant

Soils Profile/Topography/Hydrology

- Level sandy river terraces or outwash plains
- Soil texture and drainage vary from silty and somewhat poorly drained to sandy and excessively drained, with moderately well-drained, loamy soils being most common

Indicator Species of Healthy System

- Big bluestem
- Prairie dropseed
- Indiangrass
- Little bluestem
- Porcupine grass
- Switchgrass
- Prairie cordgrass
- Common forb species include purple prairie-clover, stiff goldenrod, white prairie-clover, rough blazing-star, Canada goldenrod, Missouri goldenrod, prairie thistle, smooth aster, stiff sunflower, Maximilian sunflower, smooth rattlesnake-root, white sage, and wood lily
- Leadplant, prairie rose, sand cherry, wolfberry, and prairie willow are the predominant shrub species

Unhealthy Systems

General Structure

- Low biodiversity – plants, insects, birds, other animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration
- High soil erosion potential
- Invasion by woody species
- Nutrient enrichment
- Tile drained or ditched, resulting in altered hydrology

Indicator Species of Unhealthy System

- European brome and other non-native grasses
- Ragweed
- Mare's tail
- Queen Anne's lace
- Canada thistle
- Wild parsnip

Protection and Management Considerations

Causes of Change

- Prairie community is dependent on fire to prevent brush and trees from establishing on the site. Lack of fire causes these communities to succeed to brushland and woods
- Introduction of agriculture and livestock grazing
- Soil disturbance from development
- Invasion of competitive, non-native plants
- Change in hydrologic regime (wetter or drier)

Restorative Capacity

- Highly restorable under well-designed and implemented restoration and management program
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy

- Adopt land development practices that place a high priority on ecological protection.
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

Bedrock Bluff Prairie

Healthy Systems

General Structure
- High biodiversity – plants, insects, birds, and animals
- High diversity of native plant species
- Predominance of warm-season grass species
- Natural succession and progression toward conservative species
- Full to nearly full sun
- Drought tolerant

Soils Profile/Topography/Hydrology
- Soils are extremely thin and rocky with exposed bedrock
- Excessively drained soils
- High evaporation rates and extreme temperatures

Indicator Species of Healthy System
- Porcupine grass
- Side-oats grama
- Prairie June-grass
- Little bluestem
- Sun-loving sedge
- Prairie dropseed
- Plains muhly
- Hairy grama
- Leiberg's panic grass
- Long-leaved panic grass

Unhealthy Systems

General Structure
- Low biodiversity – plants, insects, birds, animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration
- High soil erosion potential
- Nutrient enrichment

Indicator Species of Unhealthy System
- European brome and other non-native grasses
- Ragweed
- Mare's tail
- Queen Anne's lace
- Canada thistle
- Wild parsnip

Protection and Management Considerations

Causes of Change
- High evaporation rates and extreme temperatures reduce the invasion of woody vegetation on bluff prairies, but fire nonetheless is important in preventing these communities from succeeding to savanna or woodland
- Invasion of competing non-native shrubs
- Encroachment of adjacent development with associated pollutants
- Intensive grazing

Restorative Capacity
- Highly restorable under well-designed and implemented restoration and management program
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy
- Adopt land development practices that place a high priority on ecological protection.
- Implement an annual, long-term restoration and management plan

Sand-Gravel Prairie

Healthy Systems

General Structure

- High biodiversity – plants, insects, birds, and animals
- High diversity of native plant species
- Predominance of warm-season grass species
- Natural succession and progression toward conservative species
- Full to nearly full sun
- Drought tolerant

Soils Profile/Topography/Hydrology

- Drier, steep edges of sand terraces and hillsides
- Soil texture and drainage vary from silty and somewhat poorly drained to sandy and excessively drained, with moderately well-drained, loamy soils being most common

Indicator Species of Healthy System

- Porcupine grass
- Side-oats grama
- Prairie June-grass
- Little bluestem
- Sun-loving sedge
- Prairie dropseed
- Blue grama
- Needle grass
- Plains muhly
- Wilcox's panic grass
- Prairie sagewort
- Milk-vetch
- Prairie cinquefoil

Unhealthy Systems

General Structure

- Low biodiversity – plants, insects, birds, other animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration
- High soil erosion potential
- Buildings
- Nutrient enrichment

Indicator Species of Unhealthy System

- European brome and other non-native grasses
- Ragweed
- Mare's tail
- Queen Anne's lace
- Canada thistle
- Wild parsnip

Protection and Management Considerations

Causes of Change

- The sand-gravel prairie community is dependent on fire to prevent brush and trees from establishing on the site. In the absence of fire these communities will succeed to brushland or woodland communities.
- Introduction of agriculture and livestock grazing
- Soil disturbance from development
- Invasion of competitive, non-native plants
- Change in hydrologic regime (wetter or drier)

Restorative Capacity

- Highly restorable under well-designed and implemented restoration and management program
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy

- Adopt land development practices that place a high priority on ecological protection
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

Lowland Hardwood Forest

Healthy Systems

General Structure

- High biodiversity – plants, insects, birds, and animals
- High diversity of native plant species
- Relatively closed canopy

Soils Profile/Topography/Hydrology

- Wet-mesic sites with seasonally high water tables with drier soils above the water table
- Located adjacent to streams, rivers or lowland ravines
- Found in fire-protected areas

Indicator Species of Healthy System

- American elms
- Black ashes
- Slippery elm
- Bur oak
- Hackberry
- Green ash
- Basswood
- Black ash
- Tall-shrub layer is a discontinuous mixture of upland and lowland shrubs.

Unhealthy Systems

General Structure

- Low biodiversity – plants, insects, birds, other animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration
- High soil erosion potential
- Nutrient enrichment

Indicator Species of Unhealthy System

- European buckthorn
- Tartarian honeysuckle
- Black locust
- Boxelder
- European brome, Kentucky bluegrass, and other non-native grasses
- Agricultural weed species

Protection and Management Considerations

Causes of Change

- Introduction of agriculture and livestock grazing
- Soil disturbance from development
- Invasion of competitive, non-native plants
- Change in hydrologic regime (wetter or drier)

Restorative Capacity

- Highly restorable under well-designed and implemented restoration and management program
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy

- Adopt land development practices that place a high priority on ecological protection.
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

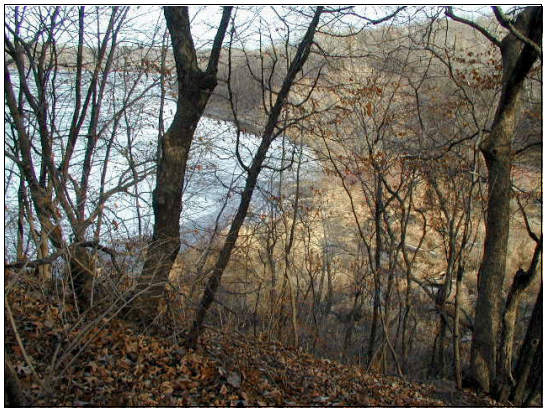
Seepage Meadow

Healthy Systems

General Structure
- High biodiversity – plants, insects, birds, and animals
- High diversity of native plant species
- Abundance of sedge species

Soils Profile/Topography/Hydrology
- Presence of cold groundwater moving in rivulets, and spring heads or zones of groundwater discharge
- Commonly at the base of stream terrace slopes

Indicator Species of Healthy System
- Skunk cabbage
- Angelica
- Broad-leaved sedges
- Northern marsh fern
- Jewel-weed



Unhealthy Systems

General Structure
- Low biodiversity - plants, insects, birds, animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration
- High soil erosion potential

Indicator Species of Unhealthy System
- Glossy buckthorn
- Cattails
- Boxelders
- European brome, Kentucky bluegrass, and other non-native grasses
- Agricultural weed species

Protection and Management Considerations

Causes of Change
- Introduction of agriculture and livestock grazing
- Sediment, nutrient and contaminant loading from disturbed uplands
- Soil disturbance from development
- Invasion of competitive, non-native plants
- Change in hydrologic regime (wetter or drier)

Restorative Capacity
- Potential to restore under well-designed and implemented restoration and management program (requires off-site factors, such as erosion sediment, to be controlled or mitigated)
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy
- Adopt land development practices that place a high priority on ecological protection
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

Mixed Emergent Marsh

Healthy Systems

General Structure
- Shallow, open water communities
- Water depths less than 2 meters (6.6 feet)
- Emergent, submergent, floating and floating-leaved aquatic vegetation
- Presence of habitat and communities of waterfowl, amphibians, fish, furbearing mammals and invertebrates

Soils Profile/Topography/Hydrology
- Sand and gravels or shallow bedded organic matter

Indicator Species of Healthy System
- Hard-stemmed bulrush
- River bulrush
- Softstem bulrush
- Common reed grass
- Broad-leaved arrowhead
- Spike rushes
- Prairie cordgrass
- Swamp milkweed
- Jewel-weed
- Blue vervain

Unhealthy Systems

General Structure
- Low biodiversity - plants, insects, birds, animals
- Predominance of weedy, non-native vegetation
- Absence of ecological functions
- Loss of water infiltration

Indicator Species of Unhealthy System
- Glossy buckthorn
- Cattails
- Purple loosestrife
- Reed canary grass
- Eurasian milfoil

Protection and Management Considerations

Causes of Change
- Sensitivity to artificial disturbances – like water impoundment
- Water level changes or eutrophication disrupting natural processes
- Nutrient enrichment
- Dominance of cattails, reed canary grass, or common reed grass after disturbance

Restorative Capacity
- Potential to be restorable under well-designed and implemented restoration and management program in cases where off-site factors can be controlled or mitigated
- Highly disturbed sites may not be realistically restored due to extent of past degradation and uncontrollable off-site factors
- Highly disturbed sites may require replanting of native species if native seed bank is absent

Protection Strategy
- Adopt land development practices that place a high priority on ecological protection beyond that of existing wetland ordinances
- Implement an annual, long-term restoration and management plan
- Protect historic hydrologic regime/systems

Previously Completed Natural Resource Stewardship Programs

Over the past 30 years numerous natural resource stewardship programs have occurred in the park. Some of these programs are contemporary and based on scientifically-based rationale. Others are less science based and require reevaluation. The following table considers the programs that have been identified along with recommendations for continued stewardship.

Previously Completed Stewardship Programs

Program	Overview	Recommendations
Pine Plantations	A 30 acre red and white pine plantation at the west end of Schaar's bluff was planted in 1976. Pines have also been planted in several other locations, such as along the park entrance road to the Youth Lodge. The ecological appropriateness of these plantations has been questioned in recent years.	Thinning and managing the larger pine plantation on Schaar's Bluff is recommended. As the plantation naturally matures and eventually dies back, savanna systems should be phased in to replace it. The smaller pine stands, such as along the park drive on the west end, should be removed as part of the reestablishment of the ecological communities defined under the long range ecological vision. Phasing out of these trees can occur at any time.
Walnut Plantation	Walnut tree plantation in 1976 and 1977 was mostly on east end of the Hubbard sand terrace. The soils are often too dry, but vigorous trees continue to persist in areas of wetter, more fertile soil. Given the soil conditions, the trees have not prospered.	These plantations should be phased out in concert with the reestablishment of the ecological communities defined under the long-range ecological vision. In the near term, these plantations should not be allowed to spread and initial reduction of these species can occur at any time.
Oak Wilt and Diseased Tree Removal	Oak wilt and diseased elm tree removal in the park from about 1976 through 1985. Removal techniques using heavy equipment would probably not be acceptable today.	Management of diseased trees should continue to occur on a priority basis. Modern management techniques should be used.
Remnant Bluff Savanna Restoration	Remnant bluff savanna site about ¼ mile west of the park maintenance facility from 1995 to the present has had a prescribed burn every other year (on average), as well as woody plant control through either mechanical or chemical means is on-going.	Each of these program and restoration activities are viable aspects of the long-range ecological vision and should be continued and expanded in concert with other priorities.
Tall Grass Prairie Restoration	An 11-acre and 4-acre tall grass prairie planting were completed near the Youth Lodge and Archery lot area in 1997. These areas have had a prescribed burn every other year, on average.	
Invasive Species Control Program	Tatarian honeysuckle, siberian elm and buckthorn control was started in the Youth Lodge/Archery Range area in 2000 and is currently on-going. In the vicinity of the Kittentail savanna (south and east of Spring Lake Ravine) woody plant control was completed in September of 2001.	
Prairie Restoration	In October 2002, a 20-acre agricultural field (the largest of the three fields on the south side of Spring Lake Ravine) was planted to prairie grasses and forbs.	

Stewardship Plan Implementation Strategy and Priorities

The stewardship plan implementation strategy and priorities establish an overall road map toward the realization of a more healthy and vibrant natural landscape and achieving the stated vision. Implementing the plan will require a multi-phased approach spread out over an extended period of time and lock-stepped with funding appropriations and scientific expertise.

The baseline strategy for implementing the stewardship plan is to sequentially address stewardship needs based on established priorities. The key priorities include:

1) Continuing to manage ecological communities that have already been restored.
2) Mitigating immediate threats to natural areas and ecological systems.
3) Protecting and enhancing the highest quality and core areas prior to further degradation, starting with smaller units and expanding into larger systems. Restoring intact areas (those without in-holdings) and areas readily observable by the public are also top priorities. The Schaar's Bluff area stands out as the best opportunity in this regard.
4) Systematically expanding stewardship activities, with an emphasis on selecting areas that interface with previously restored areas to reduce habitat fragmentation, create sustainable systems, maintain stewardship efficiencies.

As the order of priorities suggest, the first two or three priorities are more prescriptive and specific than the fourth one. The reason for this is that the immediate threats are very definable and at a scale that can be addressed with modest levels of funding. As the priorities shift to larger systems, the specifics are less definable due to the uncertainty of acquiring in-holdings, funding availability for larger, more complex projects, and lack of detailed ecological analysis that has yet to be conducted. That said, the lack of specificity on latter priorities should not be construed as them being less important. On the contrary, the nearer-term priorities serve to set the stage for larger scale efforts down the road. Whereas addressing the top priorities will be significant achievements, they are only small parts of the overall vision for stewardship of this wonderful landscape.

Figure 5.13 highlights the key ecological stewardship priorities, followed by figures 5.14 and 5.15, which are enlargements of a couple of key level three priority areas. The figures are subsequently followed by a table that provides a broader overview of each priority.

Figure 5.13 – Ecological stewardship priorities.

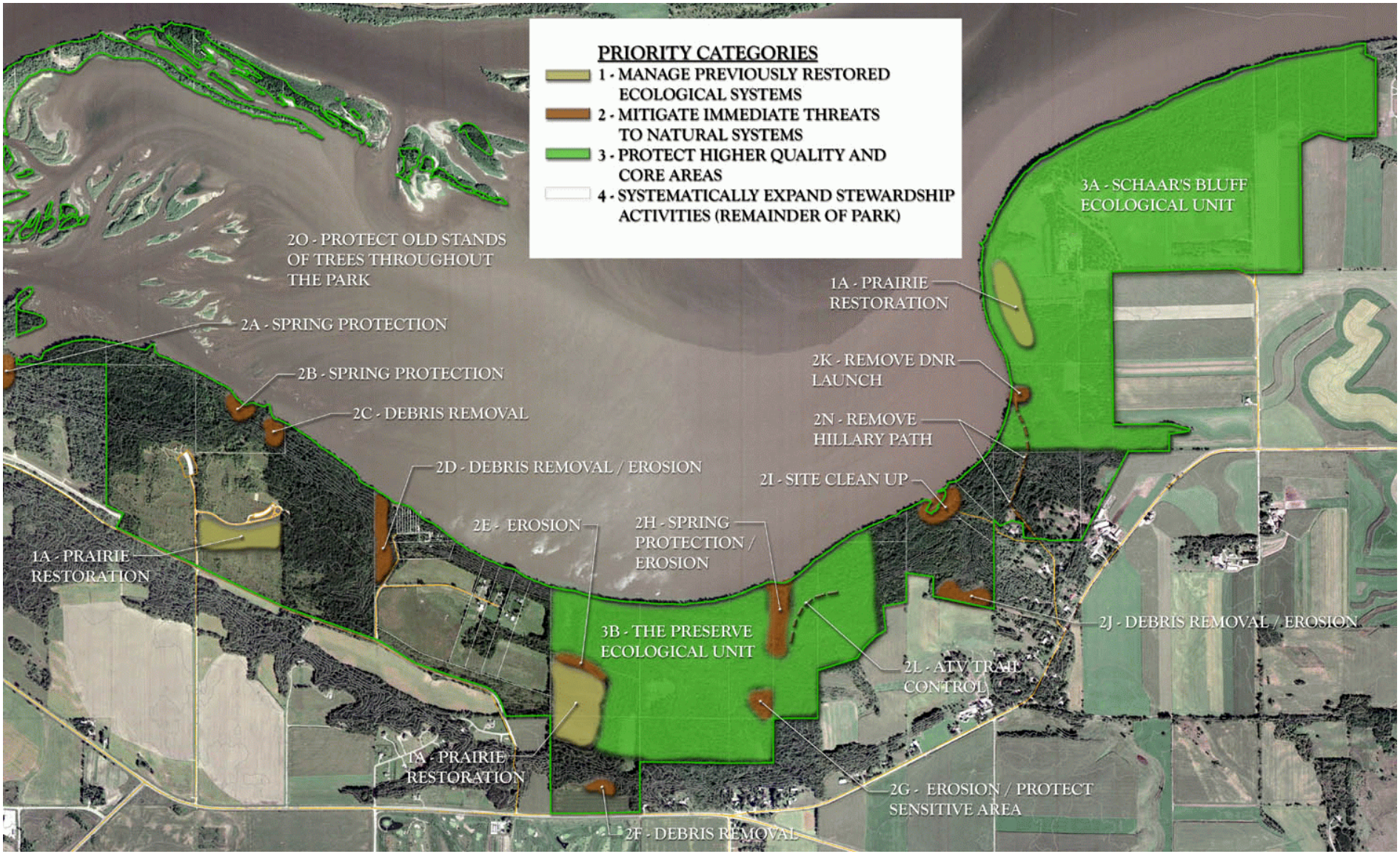


Figure 5.14 – Schaar's Bluff Ecological Unit Stewardship Priorities (3A).
(Refer to Figure 5.13 for location of ecological unit relative to overall park.)

Figure 5.15 – The Preserve Ecological Unit Stewardship Priorities (3B).
(Refer to Figure 5.13 for location of ecological unit relative to overall park.)

Park-wide Ecological Priorities (Associated with Figures 5.13, 5.14, and 5.15)

Graphic Tag		Description (Refer to Figure 5.13)	Rationale for Priority Level
1A	Prairie Restoration	Several existing restorations that are ongoing within the park.	Continued management of the these areas is vital to maintaining healthy systems.
Note: Items listed under priority category 2 are not necessarily in priority order. Actual priority order will be determined at point of implementation.			
2A	Spring Protection	A major off-site erosion condition has impacted an important spring along the river.	Continued erosion will increasing impact and degrade the spring and surrounding ecological systems. Working collaboratively with property owner to resolve problem is desired approach. Enforcement action may be required if that is not achievable.
2B	Spring Protection	One of only several existing springs within the park. Focus is on ensuring that the spring and area surrounding it are ecologically stable and healthy.	Protection is warranted due to unique qualities.
2C 2D 2F 2J	Debris Removal and Erosion	Each of these sites are old debris piles that range from small items like pails to large items like refrigerator and old car bodies. Old barrels with unknown contents and tires are also present. Site 2D is especially bad and highly visible.	These sites degrade the site ecologically and aesthetically. Cleaning them up is essential to retaining the park qualities.
2E	Erosion	An area on the low end of an existing field that is prone to erosion.	Area needs to be stabilized with natural vegetation to prevent downstream sediment and ecological issue. Restoration of the prairie area will substantially help.
2G	Erosion/ Sensitive Area	A remnant sand - gravel prairie area that is threatened.	Unique plant community that requires special attention before it is degraded any further. Small size will limit costs for stewardship.
2H	Spring Protection and Erosion	A major ecological feature that is part of the central ravine area and very ecologically sensitive.	Stewardship of this area is important to protect the spring and seepage meadow that is being degraded. Also important in that it is part of the larger ravine area that is one of the park's most impressive landforms. Protection of the spring and seepage may require upstream stewardship as well.
2I	Site Cleanup	Private marina site with substantial debris scattered around the property.	A significant ecological concern, especially impacts to nearby spring. Acquisition of this property is a high priority for this reason alone.
2K	Relocate DNR Launch	Existing DNR boat launch that is prone to erosion and debris pileup during spring floods and wind across the lake.	Poor location from a practical and ecological point of view.
2L	ATV Trails	Scattered in the middle section of the park are a series of illegal ATV trails that cross park and private in-holding properties.	Controlling this use is important to preventing continued ecological degradation. Increased patrol and working more closely with private property owners on the issue is required.
2M	Shoreline Stabilization	Entire shoreline is subject to severe erosion and debris pileups.	Erosion of the shoreline has significant ecological and cultural resource impacts that need to be controlled. This will require a multi-agency plan and funding source. Developing a working plan with the Corps and DNR is recommended first step.
2N	Remove Hilary Path	Township road that serves the boat launch and in-holder properties.	Removing a section of Hilary Path (in accordance with the Development Plan) would reduce site erosion and maintenance costs for Dakota County, DNR, and the Township.
2O	Old Growth Protection	Protect old growth oak stands throughout the park.	Stately, older trees require special attention to prevent additional losses due to shade suppression, soil erosion, and wind throw.

Graphic Tag		Description (Refer to Figure 5.14)	Rationale for Priority Level
3A	Schaar's Bluff Ecological Unit	The Schaar's Bluff area is an ecologically diverse area within the park. There has also been significant impact to ecological systems over time, including land uses associated with farming and agriculture and newer impacts, such as extensive mowed lawns for park use. The following provides an overview of each unit within this area, as ranked by general priority.	Ecological diversity coupled with high visitation by the public make this area a top priority for system-wide ecological stewardship.
	Unit 1	Existing restored prairie.	Continued stewardship is important to maintaining quality.
	Unit 2	Restoration of developed lawn areas. Includes reduction of lawns and non-native trees. Reintroduction of savanna systems in accordance with ecological vision.	Reduction of mowed turf areas in accordance with the Development Plan is more consistent with the vision for the park and increases wildlife corridors in this constricted area of the park.
	Unit 3	Bluff area ecological systems.	Stewardship of the rare bluff communities is a top priority. Also important for wildlife habitat, especially birds.
	Unit 4	Larger scale mesic forest and savanna area that is very popular for hiking and skiing. Also important bird watching area.	Important ecological systems along the bluff line that are highly visible to the public. Falls within Zones 1 and 2 of the Ecological Protection Zone map.
	Unit 5	Restoration development area.	Removal of the old sawmill operation will require restoration of the area.
	Unit 6	Elimination of the nursery.	Removal of the nursery and restoration of native plant communities in this area is part of the ecological vision for the park.
	Unit 7	Area surrounding a major development zone.	Will be a highly visible area to the public as the Development Plan is implemented. As one of the "first impression" areas within the park, exhibiting robust natural plant communities will be important for setting the stage for visitor experience.
	Unit 8	Area surrounding the existing entrance drive into the Schaar's Bluff area.	Same rationale as Unit 7. (These two units are essentially equal priorities.)
	Unit 9	Pine plantation and deciduous plantation.	Management of the pine plantation is required to maintain a healthy tree stand until it is ultimately phased out as the existing trees reach maturity and die off. No new plantings of pines should occur. Gaps that develop in the plantation should be restored to native savanna or prairie systems. Removal of the amur maple plantation in this area is also recommended.
	Unit 10	Central savanna and prairie restoration.	Important area that is very visible to the public. Includes restoration of the model airfield. (Although the actual model airfield should be returned to native plant communities as soon as permit expires.)
	Unit 11	Ravine area.	Stewardship of this area is needed to stabilize natural systems and prevent erosion.
	Unit 12	Mesic forest and savanna area on the eastern edge of the park.	Continuation of the restoration defined under Unit 6. Requires acquisition of in-holding property.
	Unit 13	Savanna and prairie area.	Continuation of the restoration defined under Unit 10. Requires acquisition of in-holding property.
	Unit 14	Ravine and bluff area.	Stewardship of this area is needed to stabilize natural systems and prevent erosion. Requires acquisition of in-holding property.
	Unit 15	Restoration of maintenance facility.	Restoration of area improves ecological continuity and wildlife corridor. Requires relocation of maintenance facility.

Graphic Tag		Description (Refer to Figure 5.15	Rationale for Priority Level
3B	The Preserve Ecological Unit	The Preserve area is center piece of the area of the park where development will be limited to protect natural and cultural amenities. This area is very ecologically diverse and exhibits a variety of landforms that are susceptible to erosion and degradation. Although some of the areas in this part of the park are higher quality, there has also been significant impact to ecological systems over time. The following provides an overview of each unit within this area, as ranked by general priority.	Ecological diversity coupled with The Preserve being the center piece of the environmental and cultural interpretation make this a high priority for ecological stewardship.
	Unit 1	Spring and seepage area.	High priority to protect springs and seepage meadow.
	Unit 2	Existing prairie restoration.	Continued stewardship is important to maintaining quality
	Unit 3	Central ravine area.	Stewardship is necessary to preserve this unique and important natural landform from degradation.
	Unit 4	Shoreline and steep slope area.	Erosion of the shoreline has significant ecological and culture resource impacts that need to be controlled. This will require a multi-agency plan and funding source. Developing a working plan with the Corps and DNR is recommended first step. Steep slopes along the shoreline need stewardship to stabilize slopes and prevent erosion.
	Unit 5	Upland areas.	Stewardship is needed to ensure healthy ecological systems.
	Unit 6	Upland areas.	Stewardship is needed to ensure healthy ecological systems.
4	Remaining Park Land	Covers the remaining areas of the park not considered under the previous priorities.	The lower ranking of these areas relative to the other priorities listed above should not be construed as being less important to the overall ecological vision for the park. It only represents a relative ranking within the context of likely funding limitations that forces priorities to be set. Designation of specific units in these areas will occur as the higher priorities are addressed and specific ecological needs are better defined.

For each of priorities defined in figure 5.13, 5.14 and 5.15, a specific implementation strategy will be developed by Dakota County Parks. In some cases, such as mitigating immediate threats, the strategy will entail steps beyond ecological stewardship per se. For example, mitigating old dump sites will require removal of debris that is often buried and hard to get at without equipment. This will cause some additional disruption to the site that will require restoration.

Qualifier to Stewardship Prioritization

The priorities established in figures 5.13, 5.14, and 5.15 are at a master plan level and will be refined as the plan is implemented. Priorities are also subject to revision based on scientific rationale and funding availability. For example, there may be areas that fall under level 4 priorities that may become higher priorities to address critical ecological concerns that arise. Likewise, ecological stewardship may become practical as part of specific developments that occur as the plan is implemented.

Phases of the Stewardship Plan for Each Ecological Community

The actual restoration of a given ecological community will occur in phases. Each phase will have distinct objectives toward attaining more diverse and healthy ecological systems within the park. The phased approach also allows for close monitoring of program successes and ensuring that resources invested in the program are appropriately allocated to their greatest value.

In general, three major phases are envisioned for the stewardship program, as defined in the following table.

Phasing Program

Phase	Overview	Additional Comment
Phase I – Testing and Education Phase	Broadens understanding of restoration needs, options, and opportunities. Also increases local residents' knowledge and understanding of restoration issues. This phase is especially important during the initial implementation phase. As the program matures over time, the need to do extensive testing prior to restoring larger tracks is diminished due to knowledge gained over that time. However, testing of restoration approaches will always remain part of the program as new conditions are encountered.	Small test or demonstration plots are the backbone of the initial testing program. Testing should occur in each ecological unit to test a cross-section of conditions found and to provide wider public exposure to the program. These tests will help determine which restoration practices are best suited for the setting. Potential test and demonstration plots include: ▸ Reduction of invasive shrub cover -- to increase light to the ground layer and stimulate growth. ▸ Regeneration of oak forests -- to stimulate new growth. ▸ Reduction of noxious weeds and woody plants -- to give competitive edge to native plant species. ▸ Reintroduction of ground cover plants and seed -- to reestablish native seeds. ▸ Establishment of community outreach programs -- so residents establish a personal stake in the stewardship program. Education plays a key role in the successful implementation of stewardship programs. The public's understanding of what is occurring becomes paramount to their support for the stewardship program. Although primarily for research purposes, the testing programs also serve as in-the-field educational tools. Direct exposure to restoration practices and their impact on the surrounding environment will give park visitors working knowledge of stewardship programs.
Phase II – Remedial Phase	Involves the major restoration and management tasks and consequently is the more expensive phase. Its focus is on returning the land to the biological and structural conditions necessary for a healthy ecological landscape to emerge and prosper.	The remedial phase employs a variety of restoration techniques in a major effort to restore vegetation and habitat structure and biological diversity and restore ecological and bio-geochemical functions. Tasks undertaken during this phase include reducing introduced nonnative and other undesirable trees and brush, removal of previous debris and substrate fill areas, addressing erosion and other problems, and other general tasks. In some cases, this phase may involve machine/mechanical planting of native plants, including larger trees and other plants. The period of time required to conduct the remedial restoration phase depends on the level of work effort required, condition of the ecological systems, opportunities and constraints (e.g., access, weather, biological response), and level of funding available for the program.
Phase III – Maintenance Phase	Represents the routine tasks that are conducted annually at strategic times to maintain specific ecological and biological objectives set for each unit and subunit.	After significant investments during Phase II, the stewardship program shifts to a lower level of intervention during the maintenance phase. This is inherently less costly and provides an excellent opportunity for long-term citizen and student involvement as volunteers. Once established, the maintenance phase is guided by both regular management techniques and by strategies that are implemented on a rotational basis through identified subunits. It is during the maintenance phase that the restoration plan would become part of the park's general operations and maintenance function. Along with this comes routine training and education of maintenance staff.

Overview of Stewardship Techniques

As the previous table defines, the stewardship program requires undertaking specific tasks to meet performance criteria and achieve improvements to the ecological systems within the park. Forthcoming is an overview of specialized, yet relatively straightforward, techniques used to carry out specific restoration tasks. Of the techniques listed, prescribed burning is the single most useful and important management method required for restoring native plant communities. The other techniques and strategies are most often used to prepare a site for prescribed burning or as a means to reintroduce proper conditions and species into sites. It is important to underscore that these techniques are used as part of a well-thought out program that considers scientific practicality, costs, and safety.

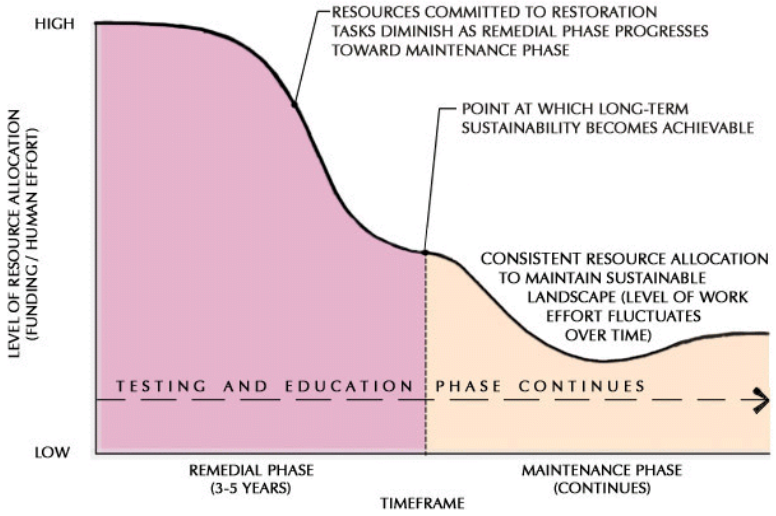
Stewardship Techniques

Technique	Description
Prescribed Burning	Prescribed burning is generally defined as *"the highly controlled use of fire under optimal weather and environmental conditions to achieve specific ecological objectives."* Wildfire and fires started by indigenous people have for centuries played an important role in the evolution of many biological systems throughout North America. It is now recognized by the scientific community just how essential the role of fire is in maintaining grasslands, wetlands, savannas, barrens, and numerous forest types. It is also recognized that fire suppression can result in gross changes in the aspect, appearance, and ecological functions of these natural systems. Fire suppression is often followed by a decline in the richness and diversity of native plants and animal species, increased litter, shading, phytotoxin build-up in substrates, decreased availability of essential nutrients and increased homogeneity in habitat structure and spatial heterogeneity. Reduced nutrient cycling and increasing domination by few species often results. In some ecosystems, shifts in wildlife and increases in shade tolerant and less flammable plant species accompany fire suppression, with detrimental effects. Simply stated, no other technique comes close to the impact that this naturally occurring phenomenon has on restoring and preserving natural ecological systems. It is a fundamental component of a restoration program.
Weeding and Brushing	Preparing the site for prescribed burning will likely be necessary on sites that have significant restoration needs, especially in locations where invasive species, like buckthorn, are dominant. Weeding and brushing are the primary techniques used where there is dense brush and little combustible fuel. Manual reduction of existing dense shrub growths will be required to open up these areas. In cases where the direct use of fire is hampered due to non-native cool season grasses being present, pre-burn treatments may be necessary, including the very careful and discriminate use of herbicides and low mowing of the grasses can reduce green foliage and, after drying, litter can be used as fuel to sustain a low-level fire. Prescribed fire usually follows 5-15 days after the herbicide treatment or after the mowed grasses are dry enough to burn, which varies depending on weather conditions. Although the use of herbicides is always kept to a minimum, their use is a fundamental aspect of creating the conditions necessary for restoring native plant communities. Carefully selected herbicides have very low toxicity to humans and wildlife and will not present a threat when used properly.
Seed Harvesting / Disbursement/ Planting	Field observations suggest that some seed banks may remain present within the park's soils, especially in areas where remnant native plant communities still exist. If carefully fostered, these seed banks can be a major facet of the restoration program and greatly reduce cost and time necessary to reestablish native systems. However, seeds and plants from local sources will also be required to ensure that sufficient quantity and quality exists to undertake a successful restoration program. This is especially the case in the oak savanna and prairie systems, where much of the seed bank may have been lost due to past agricultural uses. In these instances, directly reintroducing native plant species will be necessary to reestablish healthy ecological systems. For native species that are no longer present within the park, alternative sites for seed harvesting, propagation, cultivation, and collection will have to be identified for eventual redistribution within the park. Wherever possible, seeds and plants should come from sites that are as close to the park as possible, with the outside limit being a 150 mile radius from the park. In the long-term, once native communities are reestablished, the park itself will be its own source for seeds and plants.

Time Frames for Implementing Stewardship Programs

Although generalized, the work tasks and techniques involved in restoring and managing the park's natural resources remain relatively consistent between phases and between ecological systems. A step-by-step process using the defined techniques should be implemented sequentially over a period of time to achieve certain desired results. Although the techniques are relatively consistent between phases, the primary distinction lies in the intensity of the work involved to achieve a set of objectives, and the use of one restoration technique over that of another.

Figure 5.16 – Work effort required between the remedial and maintenance phases over time.



For example, the initial removal of dense clusters of buckthorn in a given area may require substantial effort during the remedial phase. Under the maintenance phase, continued removal will still be necessary, but require substantially less effort. Figure 5.16 illustrates how the level of restoration effort lessens as the management plan moves from the remedial into the long-term maintenance phase.

As figure 5.16 illustrates, the remedial phase can take three to five years to complete for each ecological community within a given land unit. This time frame is highly dependent upon the magnitude of the work involved to complete restoration tasks and the resources committed to this effort. The maintenance phase begins once remedial work is completed and continues on indefinitely at a sustainable level.

As illustrated, the work effort under the maintenance phase will fluctuate due to the ever-changing micro conditions found across the site. Under this time frame scenario, complete restoration of the site will realistically take ten, fifteen, or even twenty or more years to accomplish even under the best funding scenarios.

Stewardship Approach for the Dominant Ecological Systems

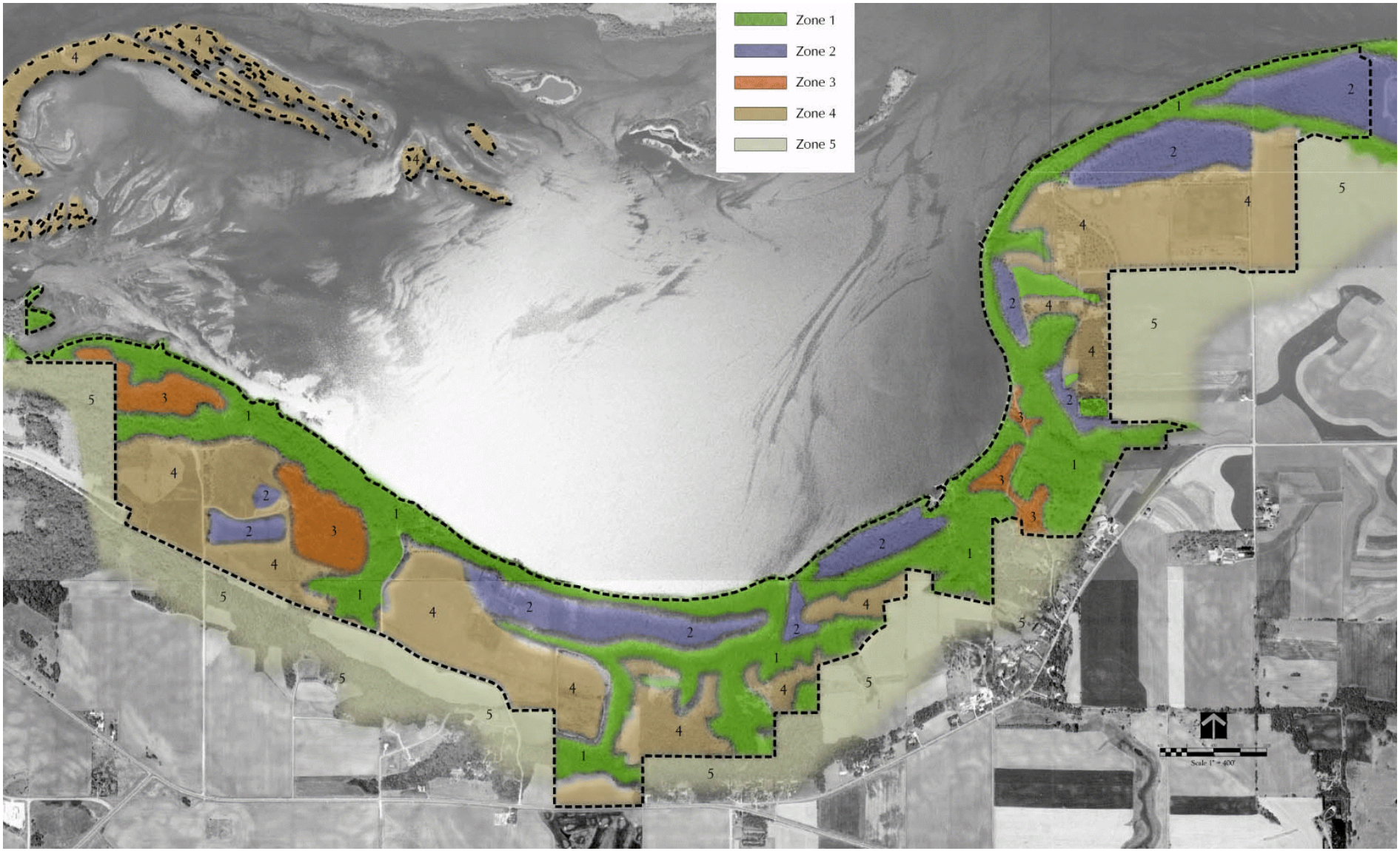
The following table provides an overview of the general restoration approach for each of the dominant ecological systems.

System	Overview of Restoration and Management Approach
Oak Savanna Dominated System	The past use of much of the upland area for agricultural and pastures has left only isolated pockets of remnant oak systems. In areas within the park where savannas are envisioned, fire suppression and lack of management has led to an overstocked canopy and an understory of dense underbrush in some areas. Non-native species, such as buckthorn, dominate native species in some areas to the point where oaks are not regenerating themselves and native grasses are becoming scarce. Under these conditions, reestablishing the oak savanna system can only occur through a well-conceived restoration and management program. It is important that the restoration program focus on restoring an oak savanna system versus a prairie system. The primary difference is that caring for the remaining trees and reintroducing oak seedlings and small trees is a top priority in the restoration process and critical to reestablishing a healthy oak system. Given the time frames involved, the earlier this work is completed, the sooner a healthy stand of oaks will be realized. **Generalized Management /Restoration Approach:** 1) Remove overstocked canopy, invasive non-native and undesirable woody plants, and weed species from areas envisioned for savanna systems. Herbicide treat the stumps of woody plants, especially buckthorn, and other non-native grasses to create proper conditions for prescribed burning. Mowing may also be used to prepare area for burning. 2) Undertake prescribed burning on a regular (1-3 year) cycle until native plants respond. 3) Seed with locally collected native plant seeds where native species seed banks are not present or do not respond to the above treatments. Seeding of native prairie grasses and forbs in existing old fields should be conducted by no-till drilling or scattered by hand after prescribed burning. Tillage is not desirable as this could stimulate weed species seeds. 4) Plant seedlings and trees in select locations over a period of time to reestablish a dynamic oak system. 5) Monitor and report results. Adjust program as warranted.
Mesic Oak Forest Dominated System	The ground cover vegetation in this system is progressively collapsing as time goes on, with fewer and fewer native species being found – especially at the ground level. Native ground cover vegetation in this system is out-competed by an overstocked understory of woody plants and dense buckthorn. The result is a serious decline in the native soil stabilizing vegetation, which tends to accelerate overland flow of water that causes erosion and poorer water quality in downstream locations. Lack of tree regeneration and virtual dominance by older age classes of oaks and other trees is a major ecological concern. The larger trees are beginning to reach pathological maturity and will begin to degenerate rapidly. This is very problematic because these older trees often do not regenerate vegetatively, which leaves little opportunity for the system to "fix itself" through natural processes alone. Human intervention in these systems will be required if they are to be sustainable. **Generalized Management /Restoration Approach:** 1) Herbicide treatment and manual reduction of undesirable introduced woody plants. 2) Remove excessive litter and fallen trees to open up the understory and allow for prescribed burning to take place. 3) Undertake prescribed burning on a regular (1-3 year) rotation. 4) Seed with locally collected native plant seeds where native species seed banks are not present or do not respond to the above treatments. 5) Stimulate hardwood species regeneration through the introduction of acorns and seedlings. 6) Monitor and report results. Adjust program as warranted.
Prairie Dominated System	The past use of much of areas envisioned for prairies for agricultural and pastures has left only isolated pockets of remnant systems. Even in these areas, non-native species, such as buckthorn and woody plants dominate native species to the point where native grasses are becoming scarce. Under these conditions, reestablishing the prairie system can only occur through a well-conceived restoration and management program. It is important that the restoration program focus on restoring a diverse prairie system. Of the systems being restored, prairies tend to respond quickly to restoration. **Generalized Management /Restoration Approach:** 1) Remove invasive non-native and undesirable woody plants and weed species from prairies designated areas. Herbicide treat the stumps of woody plants, especially buckthorn, and other non-native grasses to create proper conditions for prescribed burning. Mowing may also be used to prepare area for burning. 2) Undertake prescribed burning on a regular (1-3 year) cycle until native plants respond. 3) Seed with locally collected native plant seeds where native species seed banks are not present or do not respond to the above treatments. Seeding of native prairie grasses and forbs in existing old fields should be conducted by no-till drilling or scattered by hand after prescribed burning. Tillage is not desirable as this could stimulate weed species seeds. 4) Monitor and report results. Adjust program as warranted.

Ecological Protection Strategy Relative to Development

As defined in Section III – Vision Statement, ecological preservation is a key aspect of the overall vision for Spring Lake Park Reserve. To achieve this, development within the park was significantly influenced by the establishment of protection zones that help guide decisions on stewardship priorities and establish development parameters. Figure 5.17 illustrates the protection zones identified for the park, followed by a table that describes each zone.

Figure 5.17 – Ecological protection zones.



Ecological Protection Zone Descriptions (associated with figure 5.12)

Zone	Ecological Significance	Development Approach
1	▸ Highly sensitive ecological areas (bluff lines, ravines with slopes 12% or greater, and lake/river edge. ▸ Requires high degree of protection due to landscape character and susceptibility to degradation (erosion, etc.).	▸ Development within this zone to be carefully considered, with significant emphasis on resource protection. Passive, non-intrusive recreational opportunities will have the highest merit within this zone, although there will be instances where resource protection will have to be balanced against public access to the river and lake.
2	▸ Largely intact ecological areas requiring substantial protection to a level near that of Zone 1. ▸ Typically forested communities, but also includes unique systems such as bluff prairies.	▸ As with zone one, development within this zone to be carefully considered, with significant emphasis on resource protection.
3	▸ Less intact, but still significant, ecological areas that justify significant protection. ▸ Requires more substantial ecological restoration than Zones 1 and 2.	▸ Allows for more flexibility on development than zones 1 and 2, although these areas remain ecologically sensitive.
4	▸ More disturbed landscape due to past land uses (i.e., agriculture, pasture land, development). ▸ Often requires significant ecological restoration to reinvigorate natural landscape.	▸ Highest level of flexibility on development, although ecological stewardship remains a key factor in decisions.
5	▸ Area outside of the defined park boundary that may play a role in protecting the park in variety of ways (i.e., habitat continuity, ecological integrity, aesthetics, stormwater management, etc.).	▸ Any ecological protection strategies that occur outside the park would require a partnership with willing landowners.

The development plan as presented in Section VII – Development Plan has taken these protection zones into consideration, with an emphasis on developing a balance between access to the river and lakeshore against the goal of preserving the park's natural and cultural values.

Spring Lake and Mississippi River Stewardship Issues

Although Spring Lake and the Mississippi River are under State and Federal jurisdiction, they are unquestionably major landscape features that are instrumental in creating the parks's sense of place and give it its unique qualities. The stewardship of these amenities is of significant importance. As part of the master planning process, Dakota County collaborated with several State and Federal agencies to develop a common vision for the future for the lake and river. Agencies and other groups that were either directly involved or provided planning studies that influenced the master plan include:

- US Army Corps of Engineers
- Minnesota Department of Natural Resources
- National Park Service – Mississippi River National River and Recreation Area
- Friends of the Mississippi River
- Prairie Island Mdewakanton Community

Specific plans referenced include:

Pool 2 Habitat Visioning Study: Conducted by the interagency River Resources Forum. The study is looking at a series of temporary pool drawdowns in the Upper Mississippi River system, to restore aquatic vegetation and habitat conditions. Modest drawdowns (1-3 feet) can expose large areas of bottom sediments, allowing them to consolidate and support germination of the native seed bank. Near the end of the growing season, the pool water level is returned to its normal elevation. The impacts of a drawdown are most significant in the lower portions of the pool, which for Pool 2 would include Spring Lake. The Corps, in partnership with state and federal agencies, has completed a two-year drawdown in Pool 8 (Onalaska to Genoa, WI), with good results.

US Army Corps of Engineers' Channel Maintenance Management Program: In addition to maintaining the main channel for navigation, the program includes some restoration projects such as a beach restoration downriver from Spring Lake Park Reserve and an island restoration project near the downstream end of Spring Lake Park Reserve. Twelve wing dams in Pool 2 will be notched to improve downstream fish habitat. The study has also looked at but tabled a channel modification near Boulanger Bend (just north of Schaar's Bluff). River shippers had expressed interest in a channel that would cut closer to the bluff, shortening their route by 3,500 feet.

Interagency Environmental Management Program (EMP) and Habitat Restoration and Enhancement Projects (HREPs): This partnership program plans and constructs habitat restoration projects through varied means, such as controlling flows to backwater areas, sediment removal, plantings, and island construction. Riverine habitat projects are developed in the five Upper Mississippi River States, although there are none this year for the Pool 2 area.

Spring Lake and Mississippi River Vision Statement

From the perspective of Spring Lake Park Reserve, the vision for Spring Lake and the Mississippi River is consistent with the goals for improving habitat conditions as defined in the *Interagency Environmental Management Program* defined above. Specific goals of the program include:

- Improve water quality
- Reduce erosion, sediment, and nutrient impacts
- Return of natural floodplain to allow more habitat diversity
- Provide for seasonal flood pulse and periodic low flow conditions
- Restore backwater/main channel connectivity
- Manage side channels, create islands, shoals, and sandbars
- Manage channel maintenance and dredged material placement
- Sever pathways for exotic species
- Provide native fish passage at dams

Devoid of emergent vegetation, the lake does not achieve its ecological and habitat potential.

Erosion of the shoreline coupled with impacts of debris being washed up on shore are major ecological concerns.

Overview of the Mississippi River Environmental Plans for the Spring Lake Area

The goals of the interagency plans and programs are comprehensive and long-range. Likewise, implementation of the program is in its relatively early stages and will take years to be fully realized, as is the case with any major ecological restoration initiative.

In the area of Spring Lake Park, the most likely nearer-term habitat restoration project is the reestablishment of a mixed emergent marsh in Spring Lake as illustrated in figure 5.11on page 5.20. The basic idea would be to drawdown Pool 2 (which encompasses the lake) by approximately one foot or slightly more during the growing season (June-early October) to allow emergent vegetation to reestablish itself. The US Army Corps of Engineers, with cooperation from state and federal resource agencies, has done successive drawdowns in Pool 8 (LaCrosse to Genoa, WI) for the last two years, with good results. The agency analyzed the seed stock in the sediments beforehand to determine the type of plant species that would be likely to grow during the draw down.

Typically, the drawdown occurs over two successive growing seasons, which was found in previous projects to be adequate for plants to establish good root systems. During the drawdown, there may be a need to raise the water elevation during low flow periods to maintain the 9 foot navigation channel. After the desired number of drawdown cycles, the pool is maintained at its normal elevation. From a timing standpoint, the drawdown may not occur for many years due to the many factors involved and funding limitation.

In addition to the pool drawdown, another significant ecological concern is shoreland stabilization and protection. Currently, much of the shoreline is routinely eroded due to wind and wave action associated with the establishment of the dam system and pools. It is also often inundated with debris coming down river during flooding periods, with major trees often pounding the shoreline. Addressing this issue is a top priority for both an ecological and cultural perspective, the latter which pertains to the loss of archeological artifacts lost through erosion of the years since the pool was established.

Dakota County will continue to collaborate with other agencies wherever possible in order to realize the ecological vision for Spring Lake and the Mississippi River. In addition, Dakota County will collaborate with the US Corps of Engineers on the placement of spoils piles from routine dredging operations as part of the implementation of the island camping program as defined in Section VII – Development Plan.

Shoreline Stabilization

Erosion, debris pileup, degraded ecological conditions, and impacts to cultural sites are all significant concerns along the shoreline of Spring Lake. Addressing these issues will require interagency cooperation and collaboration since the lake and river are not under the direct control of Dakota County.

Park Land Water Resources Management

Water resources management refers to managing stormwater within and adjacent to the park in an ecologically-sound manner that is consistent with the larger ecological vision for the park. Fundamentally, the main principle is to manage stormwater using natural infiltration methods and preserve the natural hydrology of the site. Under this approach, stormwater runoff from parking lots, roads, buildings, and other built features will be effectively captured and treated prior to reaching downstream wetland, pond, lake, and river systems.

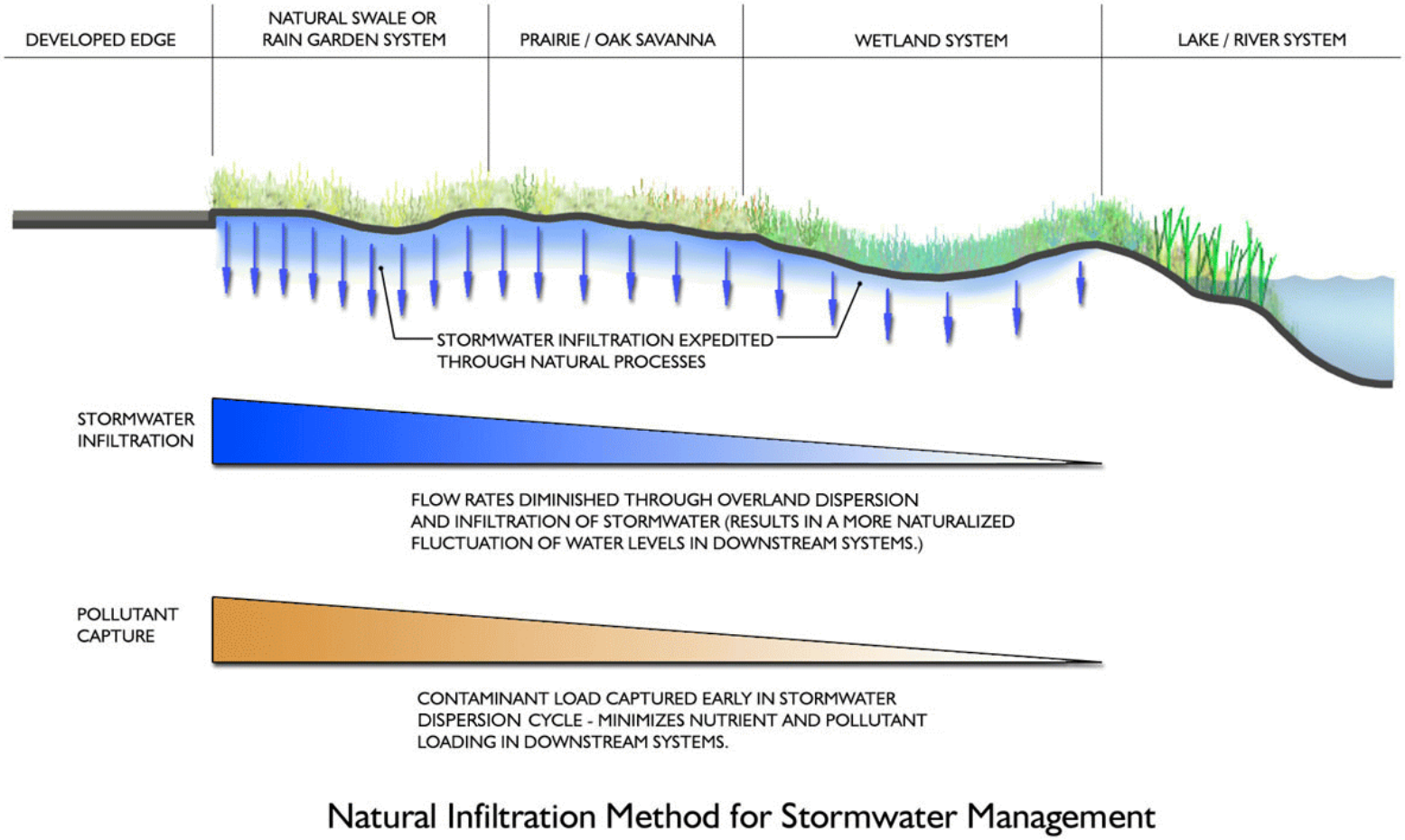
Natural Infiltration Method as an Underpinning for an Ecologically-Based Approach to Stormwater Management

The natural infiltration approach to stormwater management relies on passive, overland routing of runoff, as opposed to storm sewers, engineered ponds, and other built structures. This approach offers a couple of distinct advantages over conventional storm sewer systems:

- Introduced contaminants picked up by runoff are removed at the initial stages of water flowage rather than being transported to downstream locations and accumulating in wetland, lake, and river systems. This greatly reduces degradation to water quality and vegetative health in downstream systems.
- Stormwater flow rates and volumes more closely emulate natural conditions. This greatly reduces unnatural fluctuations in water levels in downstream systems (wetlands and lakes) and therefore reduces impacts to the natural condition of water systems and vegetation.

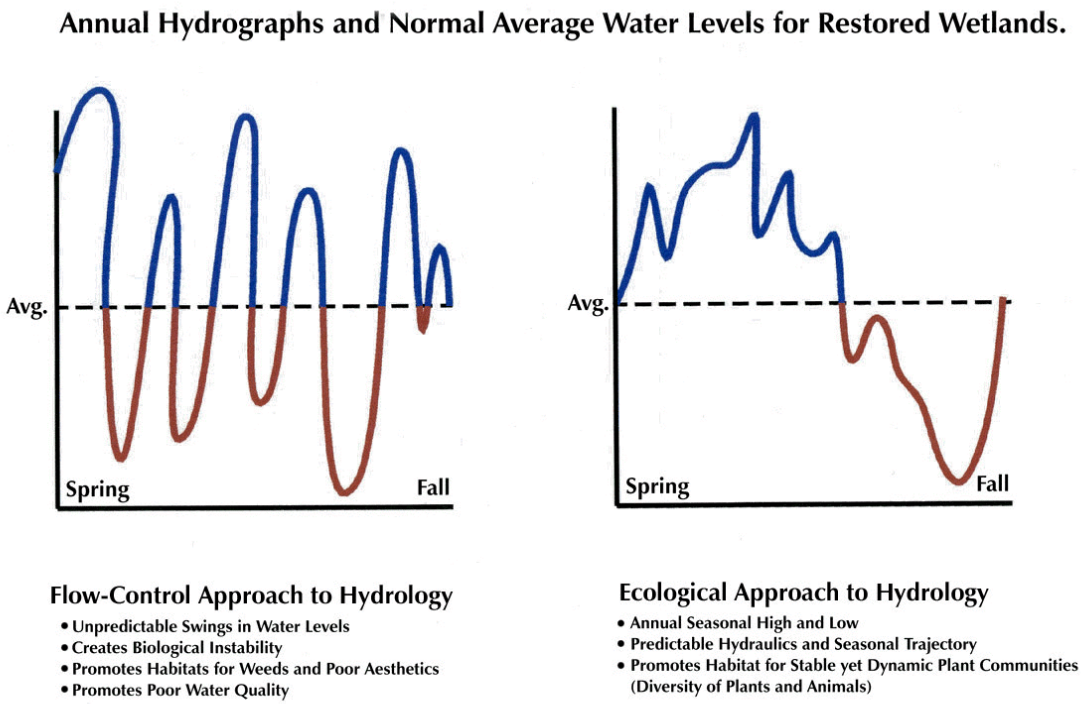
Natural infiltration systems typically consist of four primary components, each of which perform in sequence to treat the water before it enters wetlands, lakes, and rivers. Initially, stormwater runoff from the built environment is routed into swales or, more recently, “raingardens”, that are planted with native plants with deep root systems. These swales and raingardens provide initial infiltration and removal of pollutants, as well as convey runoff from developed areas and disperse it across upland and prairie systems. The upland systems (i.e., prairies and oak savannas) are the second component of this method, functioning to convey stormwater as diffused overland flow to the wetland systems that often link directly or indirectly to bordering lakes and rivers. These systems infiltrate a substantial portion of the annual surface runoff volume due to their very deep root system. They also provide additional solids settling and biological treatment. The wetlands are the third component of the natural infiltration method and provide both stormwater detention and biological treatment prior to runoff entering the lake and river systems. The final component is the lake or river, which provides stormwater detention, additional solids settling and biological treatment. Figure 5.18 illustrates the principles of the natural infiltration system in graphic form.

Figure 5.18– Principles of natural infiltration systems.



The use of a natural infiltration system also produces a much more natural hydrograph, resulting in lower peak flows and higher base flows relative to the hydrograph of a typical engineered flow rate control approach. Figure 5.19 is instructive in that it illustrates the difference between a flow rate control and ecological approach to stormwater management.

Figure 5.19– Annual hydrograph comparison.



Within the context of a regional park, the natural infiltration approach to stormwater management and hydrology is especially desirable given the emphasis placed on maintaining healthy, vibrant natural systems throughout the park.

Application of Best Management Practices for Managing Stormwater

Under the master plan, the natural infiltration approach philosophy to managing stormwater is supported by the application of Best Management Practices that address common development circumstances likely to be encountered as the park is developed/redeveloped. These practices define specific techniques that can be applied to different development scenarios to achieve stated environmental protection objectives. The Metropolitan Council's *"Urban Small Sites Best Management Practice Manual"* provides the basic underpinning for many of the techniques that will be employed wherever applicable as the park development initiatives are undertaken. Note that newly emerging ecologically-based techniques will also be applied to achieve desired ecological benefits.

Specific techniques envisioned to have application for the park include:

- Minimization of impervious surfacing for parking lots and roadways, including the use of naturally-surfaced areas for overflow/temporary parking.
- Use of infiltration systems (e.g., biofiltration systems, rain gardens, filter strips, swales, and slotted/flat curbs) as part of parking lot and hard surface designs.
- Use of infiltration techniques for managing roof runoff from buildings (e.g., downspout infiltration systems).
- Use of site grading techniques to achieve naturalized infiltration objectives.
- Use of contemporary erosion control techniques to prevent migration of soils during the construction process.
- Limiting the use of maintained turf to the more active use areas.

In addition to the Best Management practices, the master plan is also supported by the Metropolitan Council's *"Model Storm Water Management Ordinance"*, which defines specific approaches to protecting the site's ecological resources, especially wetland systems. The provisions of the model ordinance will be applied to the park's development/redevelopment as applicable.

Water Resource Management Focus Areas

Although not an exhaustive evaluation, there are several water management focus areas worthy of noting within and adjacent to the park, including:

- **Hillary Path** – leads to the existing boat launch and in-holding properties. Continued erosion of this steep and unimproved road has been a continuous concern for the Township and Dakota County Parks. The relocation of the boat launch and the acquisition of the in-holdings will resolve most the these issues. In the interim, Dakota County will continue to work with the Township on preventing additional degradation caused by erosion.
- **Off-Site Land Use Practices** – as identified in figure 5.13 on page 5.33, off-site land uses are causing significant erosion issues within the park. Working with local land owners in collaborative manner is recommended to minimize these issues.
- **Contaminated Soils** – in some areas of past development there are indications of soil contamination caused by petroleum products and chemical spills/dumping. Dakota County is encouraged to work with in-holders on these issues to prevent further degradation.
- **Protection of Natural Springs** – as identified in figure 5.13 on page 5.33, protection of the springs within the park is a high ecological and water management priority.
- **Regional Trail** – in order to stay within the park boundary, the regional trail will have to traverse through areas with significant vegetation and topography change. Construction of the trail will pose some engineering and water resource management challenges that will have to be addressed to minimize site impacts. Construction and location of the regional trail will be subject to compliance with all Mississippi River Critical Area (Executive Order 79-19) standards, including protection of slopes greater than 18 percent; ensuring bluffs remain in their natural state; minimization of site alteration; minimization and improvement of runoff; and retention of existing vegetation and landscaping.

Wildlife Habitat

Wildlife habitat is a function of healthy ecological systems. The healthier, more diverse the ecological communities are, the more diverse and rich the array of wildlife that can be found. With its location on the Mississippi River and Spring Lake, the park provides a natural corridor for migratory birds and other forms of wildlife. Today, the park still retains an abundance of wildlife, albeit less rich than historically would be the case due to habitat degradation that has occurred over time.

The innate qualities of the park, its landforms, access to water, and ecological diversity are especially important to avian and waterfowl species, as recorded in a number of studies that have been conducted in the park and surrounding area, including:

- **A Checklist of Birds – Spring Lake Youth Camp (2002)** – identifies a remarkable 233 different species of birds that frequent the park through the course of the year.
- **Waterbird Use of the Mississippi River Pool 2 (1998)** – study recorded tens of thousands migratory waterbirds using the Pool 2 area during the course of the season. Due to its unique location on the river, Spring Lake is one of the most active areas within the study.
- **Gull Migration in the Twin Cities (1995)** – study recorded over 10,000 gulls roosting in the Spring Lake area, with the sandbars and islands being primary loafing areas.

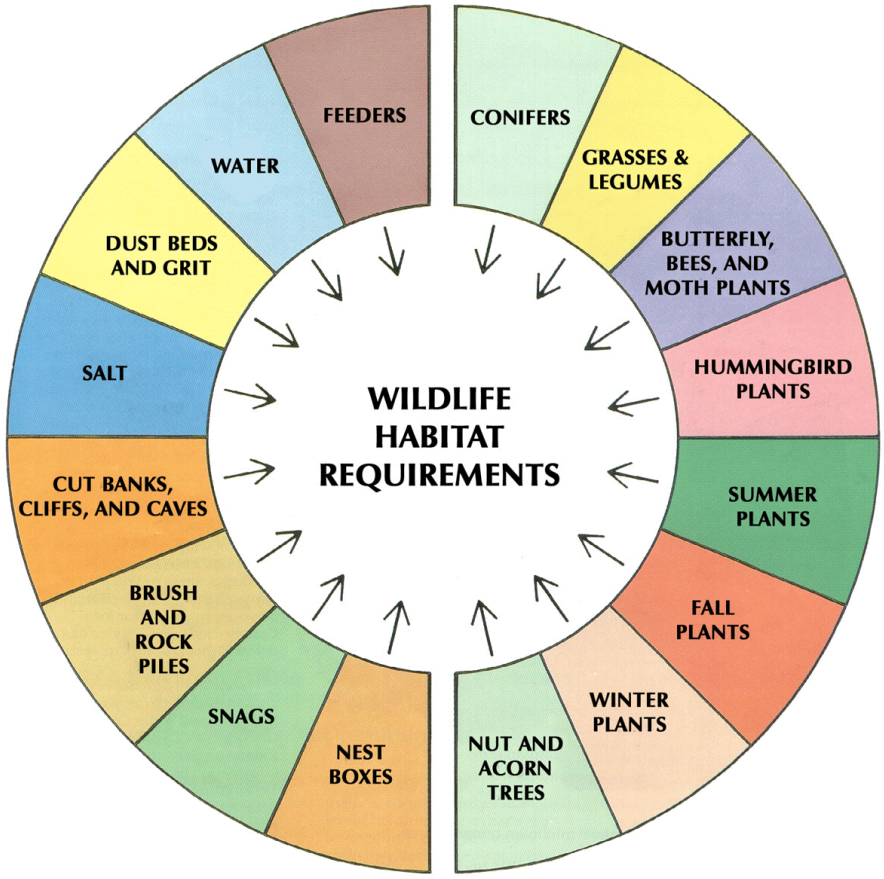
As these studies highlight, Spring Lake Park Reserve is situated along the Mississippi Flyway, a major migratory corridor within the continental United States for birds and other wildlife. The shallow backwaters of Spring Lake are a critically important "stop over " for migratory waterfowl and waterbirds during both spring and fall migration and are also utilized during the summer by a variety of waterbirds including ducks, geese, herons, egrets and gulls. Also, grassy fields in the uplands and wooded bluffs of the park are known to provide habitat for a variety of migratory songbirds and resident breeding birds and other wildlife. Of particular note, are the fields at Schaar's Bluff utilized by a variety of sparrows, and the woodlands that attract songbirds and raptors. The restored prairie area around the youth lodge has also shown a significant increase in bird sightings, underscoring the importance of habitat quality to avian populations.

The importance and robustness of the bird populations is also evident by the use of the park by bird watchers, many of whom belong to organized groups that frequent the park and record their findings. The observation opportunities, especially in the Schaar's Bluff cliffs area and along the shore on the west end of the park, make bird watching extremely accessible to amateur bird watchers and scientists alike.

Other forms of wildlife, ranging from deer to opossums, frequent the park for the same essential reasons that attract avian populations – namely the river corridor, lake, and variety of upland ecological systems. Here too, habitat degradation and fragmentation is having an impact on the diversity and frequency of wildlife sightings. Although no formal studies have been completed for the park, trained observation suggests that species adaptable to disturbed landscapes, such as deer, are thriving. Those that are less adaptive are less frequently sighted and more threatened.

Whether avian populations, mammals, and other forms of wildlife, species richness will continue to decline as the supporting ecological systems degrade. When considering the needs of wildlife, healthy, natural ecological systems provide the essential components for wildlife to flourish. Unhealthy systems, on the other hand, do not provide for the basic needs of wildlife because many of these components are lacking. Figure 5.20 defines the essential components of wildlife habitat.

Figure 5.20 Sixteen components of wildlife habitat. (Source: Landscaping for Wildlife, published by the MNDNR.)



When these components are lacking or degraded relative to a healthy system, the diversity of wildlife found within the park will diminish. This underscores the importance and priority of ecological stewardship as defined previously in this section.

Additional Study of Wildlife Habitat and Observation Opportunities

As the past studies and findings from the public process highlight, there is a degree of understanding about the wildlife that frequent the park. Expanding this body of information through additional formal research is also envisioned for the park. This will range from working closely with active groups, such as the Audubon Society, and independent studies that would be supported by State, Federal, and County grants. Specific areas of study include:

- Avian species study that expands upon current bird lists and also defines habitat requirements.
- Wildlife study that provides more detail on the types of animals and creatures that frequent the park, trends in populations, and habitat requirements.
- Aquatic species study that provides more detail on the types of fish, mussels, and other aquatic species in Spring Lake and habitat requirements.

Collaboration with other public agencies, non-profit, and private groups will be explored to take advantage of various expertise and funding opportunities.

Conclusions

As a park reserve, preserving natural open space values and ecological health is fundamental to the master plan for Spring Lake Park Reserve. Ensuring that these core values are protected, or even enhanced, in future years is of equal importance to developing the park for recreational uses.

The thoughtful development and implementation of natural resource stewardship and water resources management programs is fundamentally important to restoring and preserving natural processes in this park and achieving the vision defined by the master plan and expected by the local citizenry.